TM 9-308

RESTRICTED

WAR DEPARTMENT

TECHNICAL MANUAL

76-MM GUN MATERIEL M1 (COMBAT VEHICLES)

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Washington, 29 June 1943.

76-MM GUN MATERIEL M1
(COMBAT VEHICLES)

Prepared under the direction of the
Chief of Ordnance
(with the cooperation of Oldsmobile Division — General Motors Corporation)

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Section I

INTRODUCTION

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1. SCOPE.

a. This manual contains essential information required by the using arm for use and care of the armament on the 76-mm Gun Motor Carriage T70.

b. The materiel described and illustrated is as follows (fig. 1):

(1) 76-mm Gun M1.
(2) Cal. .50 Browning Machine Gun M2, heavy barrel.
(3) 76-mm Gun Mount T1.
(4) Periscope M4 with Telescope M47.
(5) Periscope M6.
(6) Telescope T76 and Telescope Mount T59.
(7) Ammunition.

c. The sighting equipment described herein is the equipment which has been tentatively adopted at the time of writing this manual. Different equipment may be used in carriages of later manufacture.

d. Disassembly, assembly, and such repairs which may be made by the using arm will be supervised by the car commander. All other maintenance work must be done by authorized ordnance personnel.

2. CHARACTERISTICS.

a. The armament on the 76-mm Gun Motor Carriage T70 is employed chiefly against enemy tanks and other ground objectives. The 76-mm Gun Mount T1 is located in the front of the turret which can be traversed 360 degrees, either manually or hydraulically. The 76-mm Gun M1 may be elevated to 20 degrees and depressed to 10 degrees. The cal. .50 Gun M2 is employed chiefly as a defense against enemy aircraft; however, it may also be used against ground forces. It is mounted as a flexible gun on a ring in the top of the turret, which may be traversed 360 degrees independently of the turret, or the gun may be removed from the vehicle and used with a Tripod Mount M3, which is an accessory.

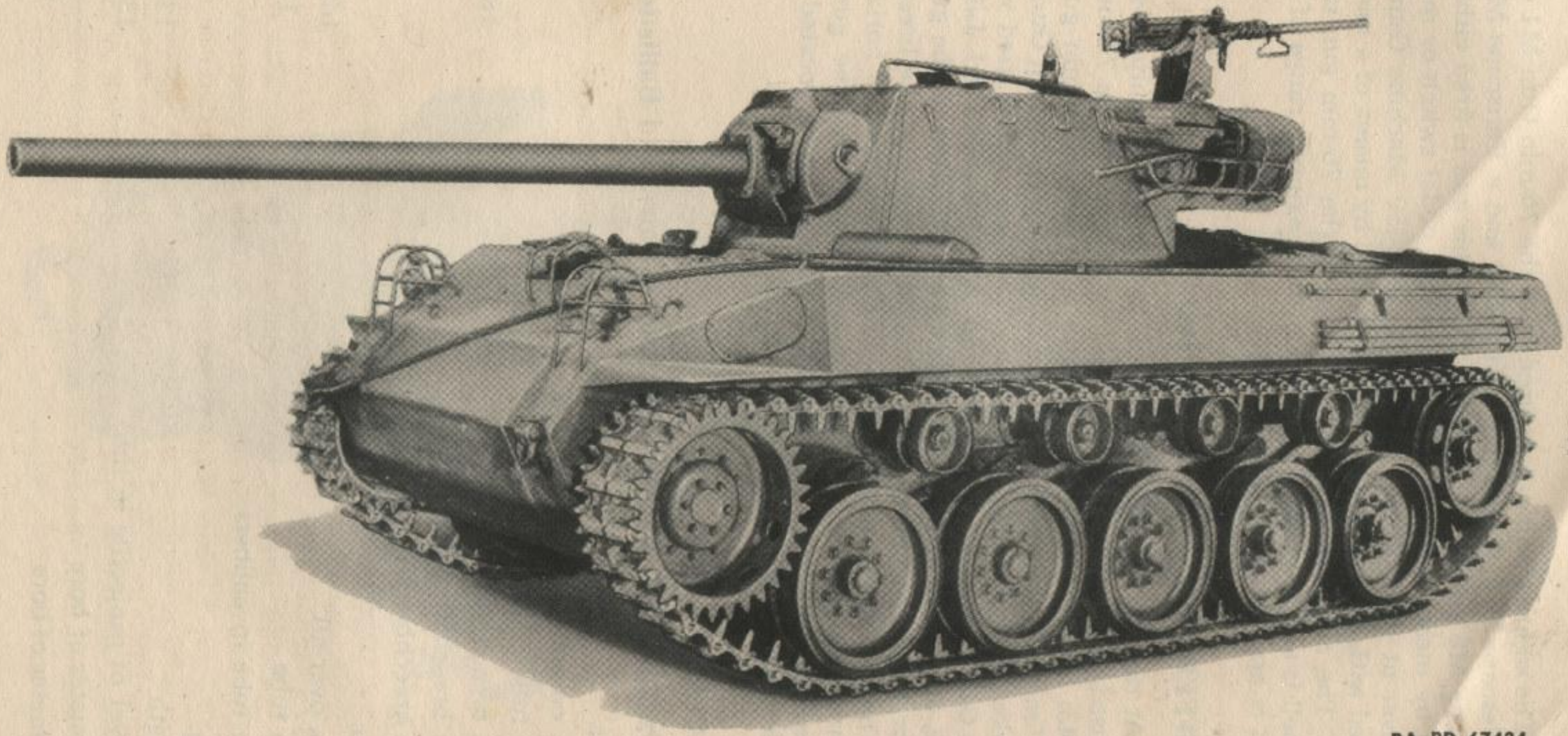

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Figure 1 — Armament — Gun Motor Carriage T70

b. The sighting equipment used with the 76-mm Gun M1 consists of a Telescope T76, Telescope Mount T59 and a Periscope M4. Two Periscopes M6 are used for observation. This gun is fired either electrically by means of a solenoid with a foot pedal switch or manually by a lever at the side of the gun. The cal. .50 Machine Gun M2 is equipped with conventional sights. It is fired by means of a back plate trigger. The maximum horizontal range of the 76-mm gun using an H.E. shell is about 14,000 yards while the maximum range of the cal. .50 gun is approximatey 7,200 yards.

3. DIFFERENCES AMONG MODELS.

a. At the present time the 76-mm M1 Gun is the only 76-mm gun being used. It is similar in design and appearance to the 75-mm Tank Gun M3; however, the length of the tube on the 76-mm gun is 46 inches longer than that of the 75-mm M3 Gun. The 76-mm Gun Mount T1 makes use of the same recoil cylinder assemblies used with the 75-mm Gun Combination Mount M34 and Mount M34A1. Like these mounts, one recoil cylinder is mounted on each side of the gun tube; however, they are so positioned in this T1 Mount that the breechblock moves up and down at an angle of 45 degrees instead of horizontally. This mount may be further identified in that a machine gun is not mounted coaxially and the elevating mechanism is located at the lower left side of the mount.

4. DATA.

a. 76-mm Gun M1, Weights, Dimensions, and Ballistics.

Weight.

Gun complete	1,141 lb
Gun tube	870 lb
Gun breech ring	187.995 lb
Gun breechblock assembly	42.04 lb
Gun breechblock	41 lb

Length.

Gun, over-all	163.750 in.
Gun tube	156.00 in.
Gun tube in calibers	52

Rifling.

Length	133.535 in.
Travel of projectile in tube	135.315 in.
Diameter of bore	3.0 in.
Diameter of bore	76.2 mm

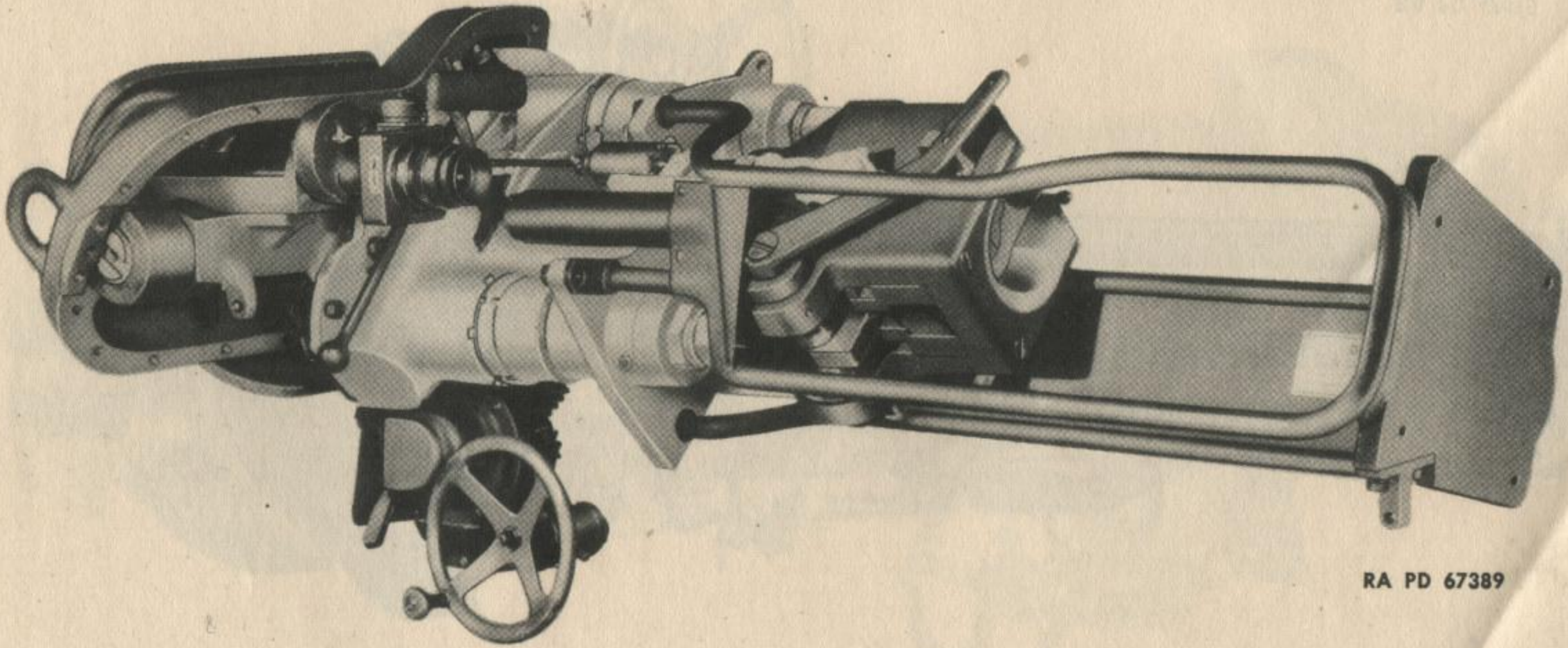

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Figure 2 — 76-mm Gun M1 and Mount T1 — Left Rear View

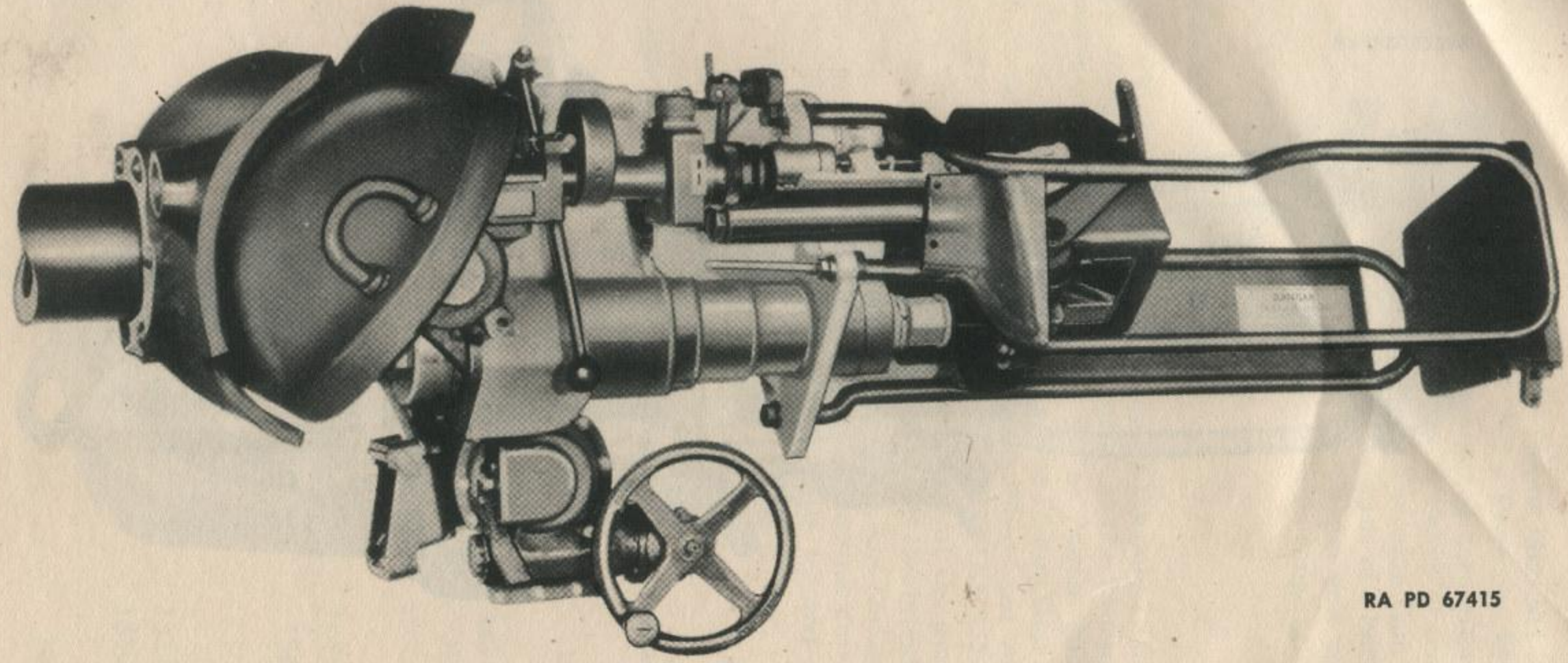

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Figure 3 — 76-mm Gun M1 and Mount T1 — Left Front View

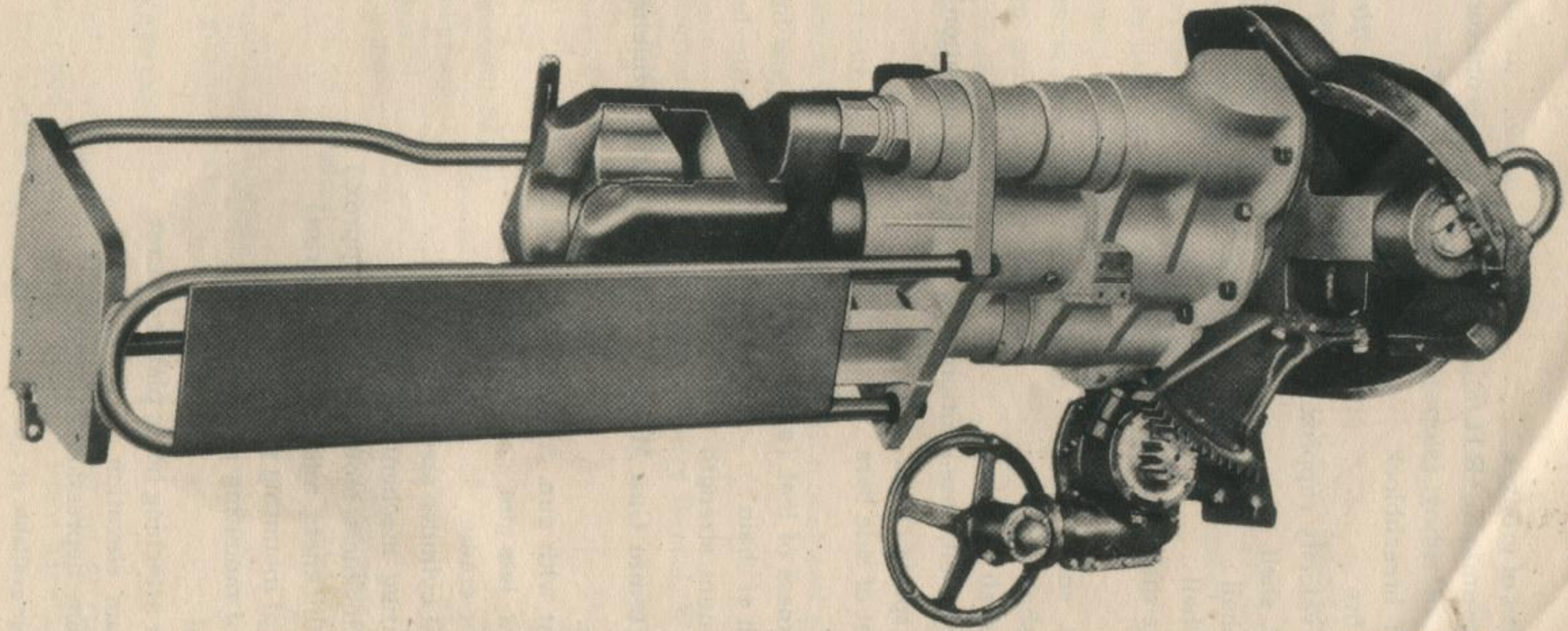

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Figure 4 — 76-mm Gun M1 and Mount T1 — Right Rear View

76-MM GUN MATERIEL M1 (COMBAT VEHICLES)

Number of grooves	28.0
Twist, uniform, R.H.	one turn in 40 calibers
Twist of rifling (slope)	4 deg 29 min
Type of breechblock	sliding
Rate of fire	20 rounds per min
Muzzle velocity (approx.).	
A.P.C. shell	2,600 ft per sec
A.P. shell	2,600 ft per sec
H.E. shell	2,700 ft per sec
Smoke shell, base ignition type	900 ft per sec
Range.	
A.P.C. shell	*
A.P. shell	*
H.E. shell (approx.)	14,000 yd
Smoke shell, base ignition type (at 12-deg elevation)	2,000 yd
Closing spring chain.	
Height of side bars	9/16 in.
Pitch	0.620 in.
Thickness of leaf (approx.)	1 in.
Width of chain	0.7 in.
Minimum strength	5,500 lb

b. 76-mm Gun Mount T1, Weights and Dimensions.

Weights.	
Mount with gun, complete	2,434 lb
Mount, less gun	1,254 lb
Mount cradle	439 lb
Recoil cylinder assembly (one)	98.0 lb
Elevating mechanism	85.7 lb
Armor thickness, mounting plate (approx.)	2.0 in.
Armor thickness, mounting plate (rim)	2.0 in.
Length of mounting plate	39.5 in.
Width of mounting plate	21.1 in.
Material	cast armor steel
Number attaching bolts, plate to turret	22
Maximum elevation	20 deg
Maximum depression	10 deg

* Data not available at time of printing.

Maximum amount of traverse	360 deg
Turns of handwheel to elevate through maximum travel (30 deg)	40.9
Turns of handwheel to traverse through maximum travel (360 deg)	290
One turn of elevating handwheel elevates or depresses (approx.)	0.733 deg or 13.03 mils
One turn of traversing handwheel traverses to left or right (approx.)	1.24 deg or 22.04 mils
Minimum time required for hydraulic traverse of 360 degrees	17 sec
Number trunnion bearings	2
Type of trunnion bearings	bushing
76-mm gun solenoid capacity at start of stroke	20 lb
76-mm gun solenoid maximum current draw	8 amp
Length of 76-mm gun recoil guard	43.3 in.
Number recoil cylinders	2
Diameter, cradle liners, I.D.	6.470 in.
General data:	
Periscope used with mount and gun	M4
Optional periscope without telescope used with mount and gun	M6
Telescope used with periscope M4	M47
Telescope used with periscope M6	T76

c. Cal. .50 Browning Machine Gun M2, Heavy Barrel, Weights, Dimensions, and Ballistics.

Caliber of bore	.50
Weight of gun	83.88 lb
Weight of barrel	29.50 lb
Weight of gun without barrel	54.38 lb
Length of gun over-all	65.125 in.
Length of gun barrel	45.0 in.
Maximum rate of fire	400 to 500 rounds per min
Muzzle velocity (in 45 in. barrel)	2,935 ft per sec
Maximum range	7,200 yd
Weight of ammunition per 100 rounds	26.0 lb
Rounds stored in gun motor carriage T70	1,000

5. BASIC WEAPONS.

a. This manual covers general information on the cal. .50 Gun M2, H.B., which is described in detail in the 23-series Field Manuals that are available to the using arms, sec. XIV.

Section II

DESCRIPTION AND FUNCTIONING OF THE 76-MM GUN M1

	Paragraph
Description of 76-mm gun M1	6
Major gun groups	7
Tube	8
Breech ring group	9
Breechblock group	10
Extractors	11
Spline shaft group	12
Percussion and firing mechanism	13
Functioning of 76-mm gun M1	14

6. DESCRIPTION OF 76-MM GUN M1 (figs. 5 and 6).

a. This gun is a flat trajectory weapon of the field gun type. It consists of a tube screwed into a breech ring and locked with a key. The breech ring contains the sliding breechblock assembly and the principal operating parts of the gun. Lugs on the top and bottom of the breech ring provide a means of attaching the recoil cylinder assemblies which are a part of the gun mount. Two bronze bearings in the lower side of the breech ring provide a support for the breechblock operating mechanism, while an additional support on the left front side of the ring mounts the closing spring mechanism. The breech may be opened by means of an operating handle secured to the spline shaft at the left side of the gun. A stop on the left side of the breech ring provides a means of latching the handle while it is not in use. Each round is loaded manually, which automatically closes the breech. The gun is fired by means of a solenoid which depresses the firing plunger located in the left cheek of the breech ring, or it can also be fired manually. After firing (during counterrecoil) the gun is cocked, the breech is opened, the cartridge case is extracted and the breechblock is locked in the down (breech open) position ready for the next round. The entire gun recoils in the mount while the recoil action is controlled by two hydraulic recoil cylinder assemblies which are built into the gun mount. Each gun is stamped with its designation, serial number, name of manufacturer, the year manufactured, and weight on the right-hand side of the breech ring. The serial number of the tube, name of manufacturer, and gun designation is stamped on the top of the tube just forward of the polished bearing surface.

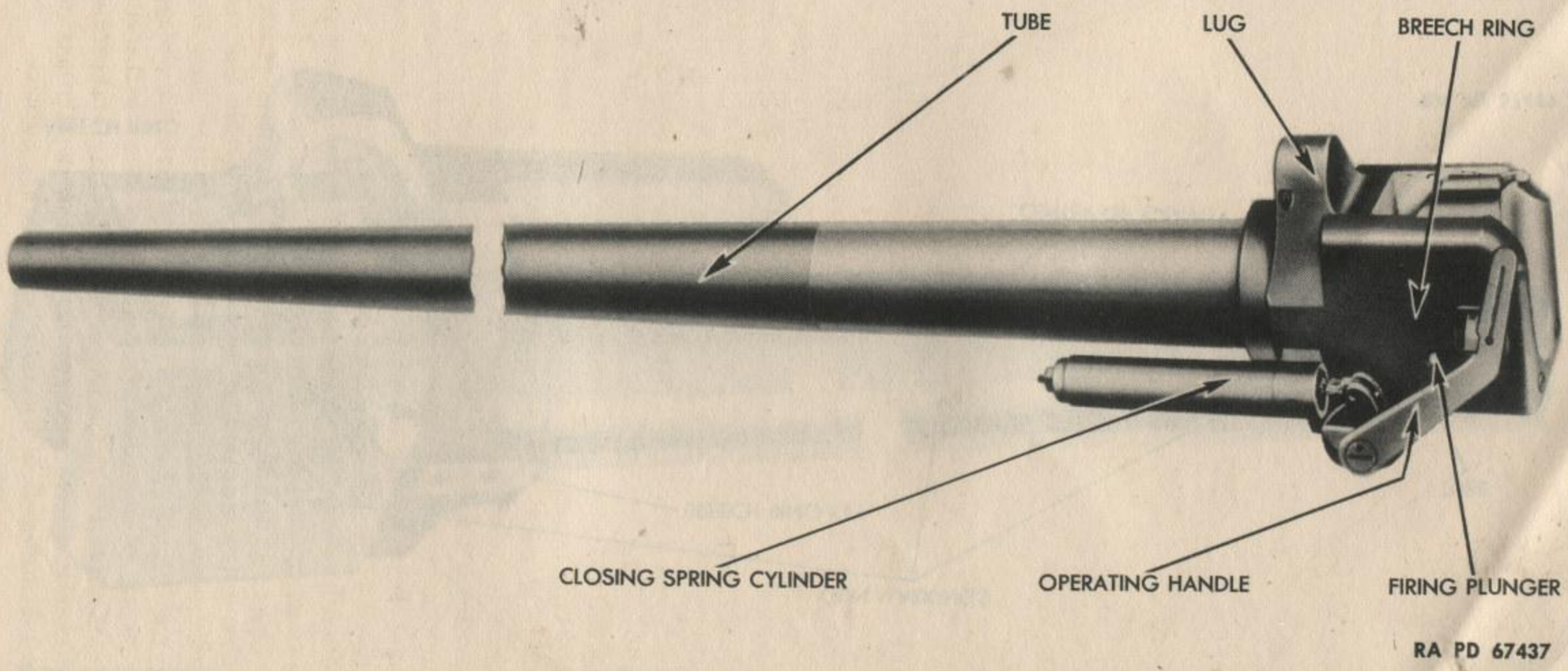

Figure 5 — Gun, 76-mm, M1 — Left Side

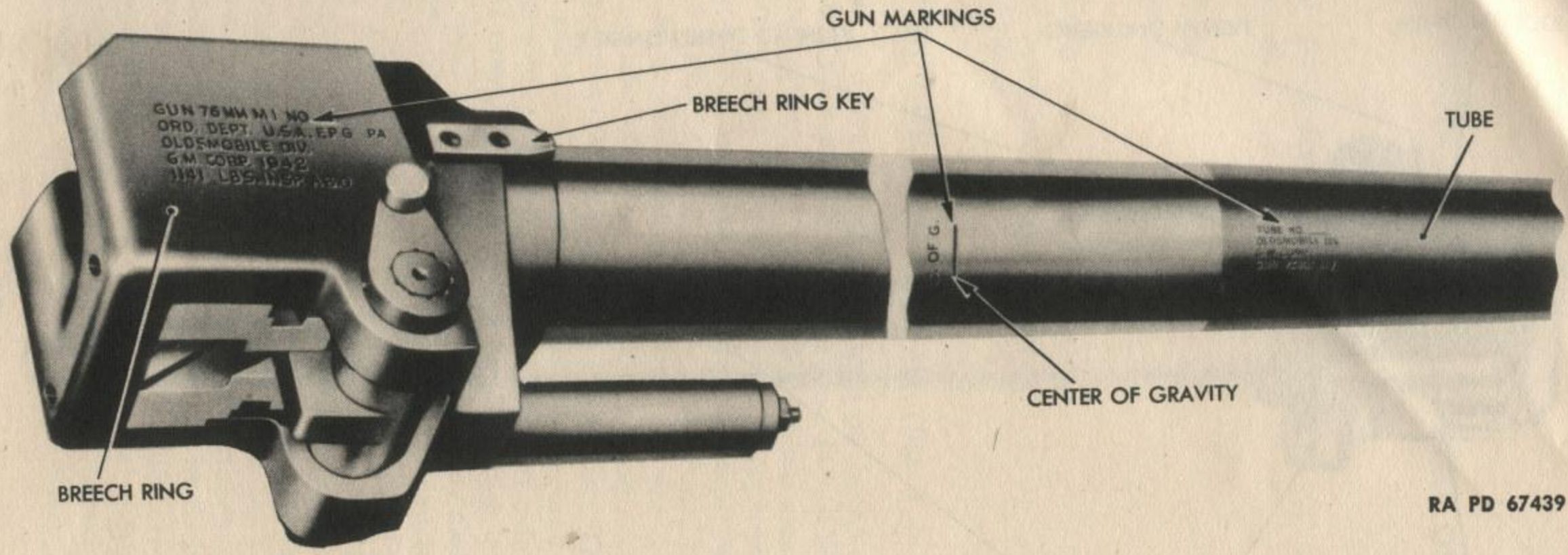

Figure 6 — Breech Ring and Tube Identification Markings

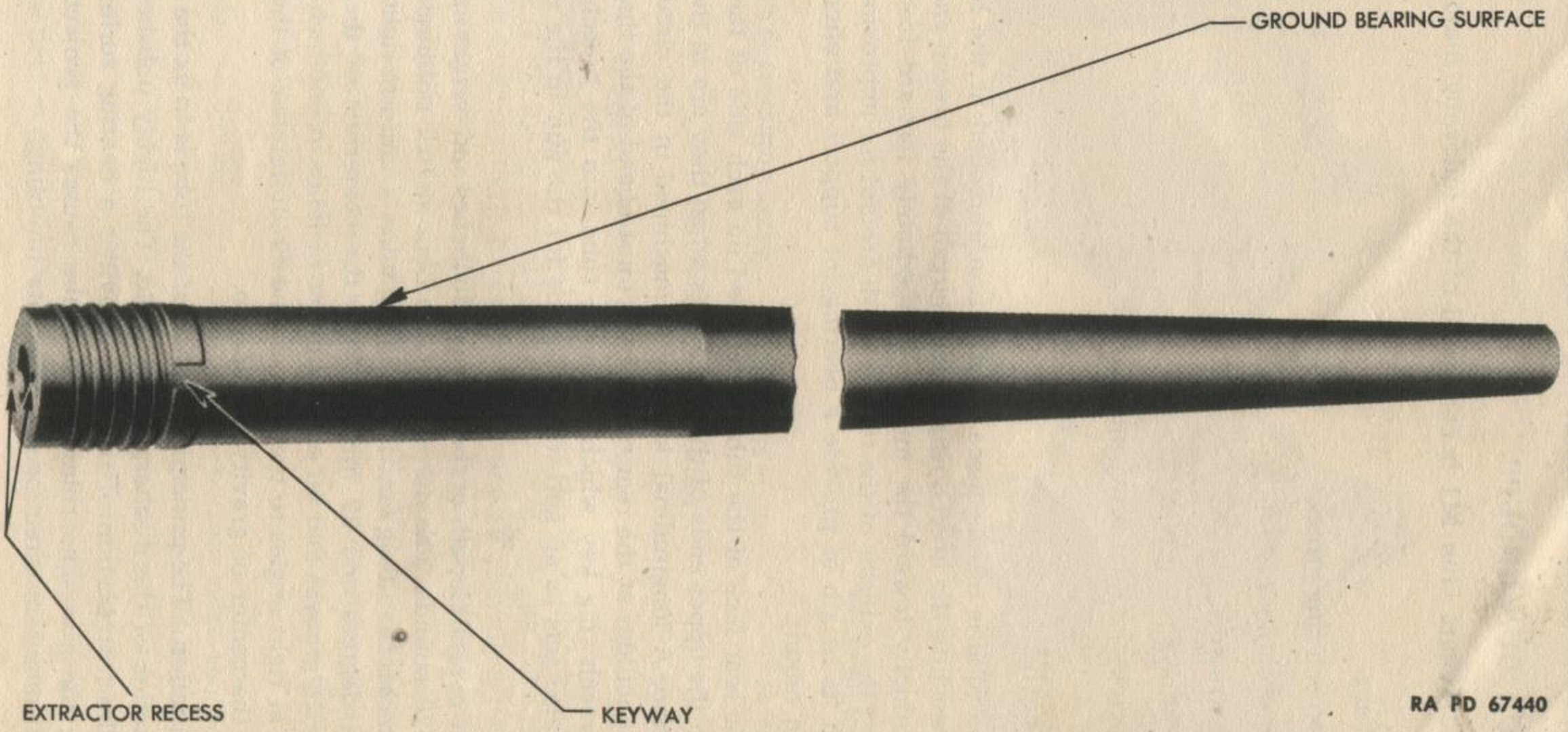

Figure 7 — Tube, 76-mm Gun M1

76-MM GUN MATERIEL M1 (COMBAT VEHICLES)

7. MAJOR GUN GROUPS.

a. The 76-mm Gun M1 is composed of the following major gun groups:

(1) Tube.

(2) Breech ring group.

(3) Breechblock group.

(4) Extractors.

(5) Spline shaft group.

(6) Percussion and firing mechanism.

8. TUBE (fig. 7).

a. The tube is of one piece construction, threaded at the breech end to screw into the breech ring. It is enlarged at the breech end and tapers gradually toward the muzzle. Immediately forward from the breech ring the exterior of the tube is finish ground for approximately one-fourth its length to provide a bearing for support and alinement in the gun mount.

b. The rear face of the tube is recessed on each side of the bore to receive the upper ends of the extractors when they are in the battery position. A longitudinal keyway is machined in the circumference of a shoulder at the rear of the tube (just ahead of the threads) for the breech ring key which locks the tube into the breech ring. The key also acts as an anti-rotation guide for the gun in the mount (fig. 6).

c. The over-all length of the tube is 156 inches and weighs approximately 870 pounds. The diameter of the bore is 76.2 millimeters or 3 inches across the rifling lands. The rifling takes a uniform right-hand twist of 4 degrees and 29 minutes from the centerline of the bore. There are 28 grooves and an equal number of lands. A one-inch mark engraved at right angles to the bore on the circumference of the tube indicates the center of gravity of the gun.

d. **Function.** The principal function of the tube is to fix the direction of motion of the discharged projectile. The highly polished surface on the rear portion of the tube provides a bearing surface for mounting the gun. The rifling in the tube causes the projectile to rotate and maintain direction and prevents tumbling.

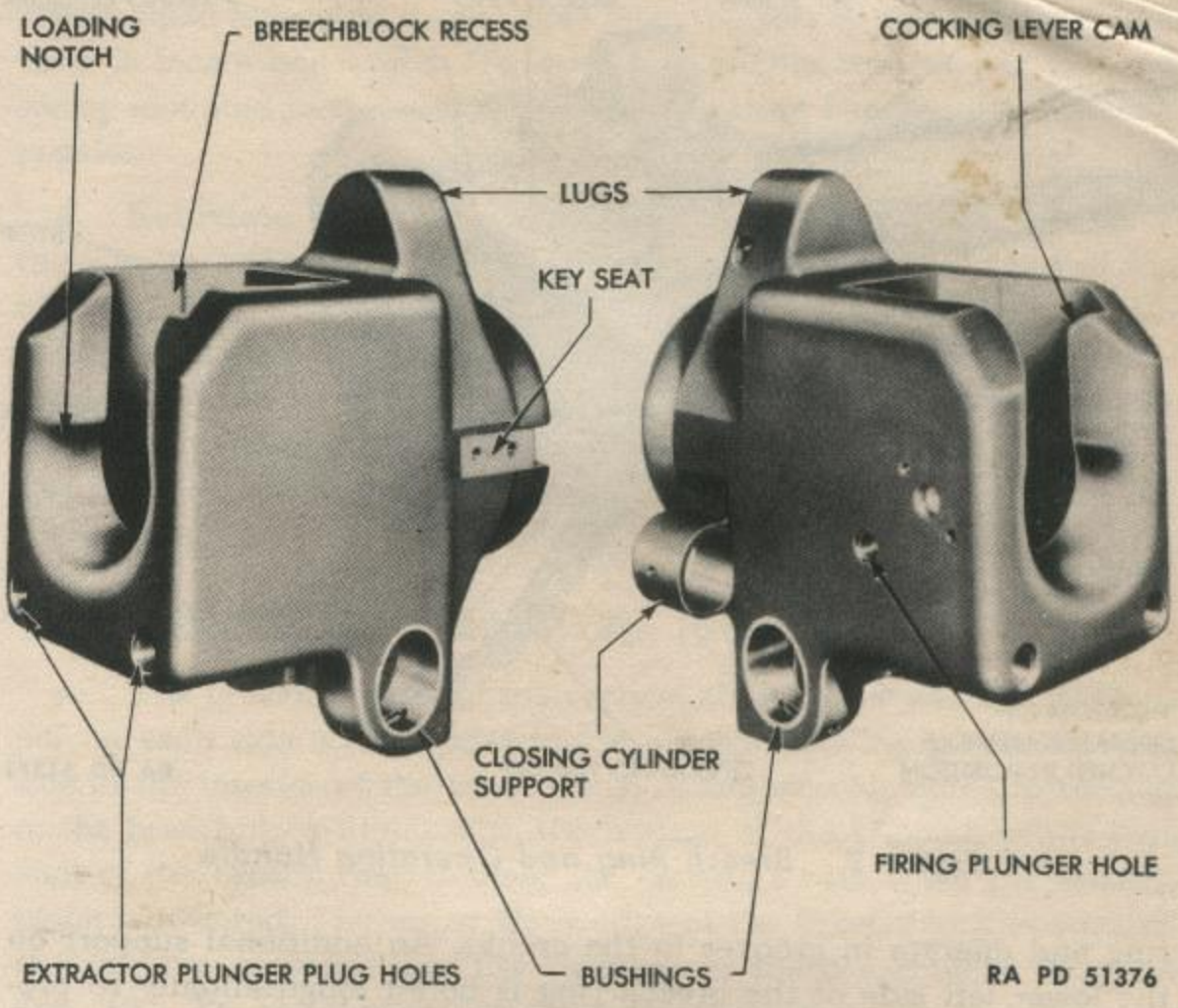

Figure 8 — Breech Ring

9. BREECH RING GROUP (figs. 8 and 9).

a. The breech ring supports and houses the breechblock assembly and most of the major operating mechanisms of the gun. The forward end of the breech ring is bored and threaded to provide a means of mounting the rear end of the tube. In the right front face a shallow longitudinal keyway is cut for the breech ring key. The front of the keyway terminates in a square notch through the front face of the breech ring, the notch alining with a keyway in the tube. The breech ring key is retained in the breech ring by two set screws to lock the tube into the breech ring (fig. 6).

b. Lugs projecting from the top and bottom near the front of the breech ring are bored and threaded to provide a means of attaching the piston rods of the recoil cylinder assemblies. The lower sides of the breech ring are bored transversely and fitted with bronze bushings to mount the operating and chain terminal cranks. The cranks are held in place by detents which are threaded into the breech

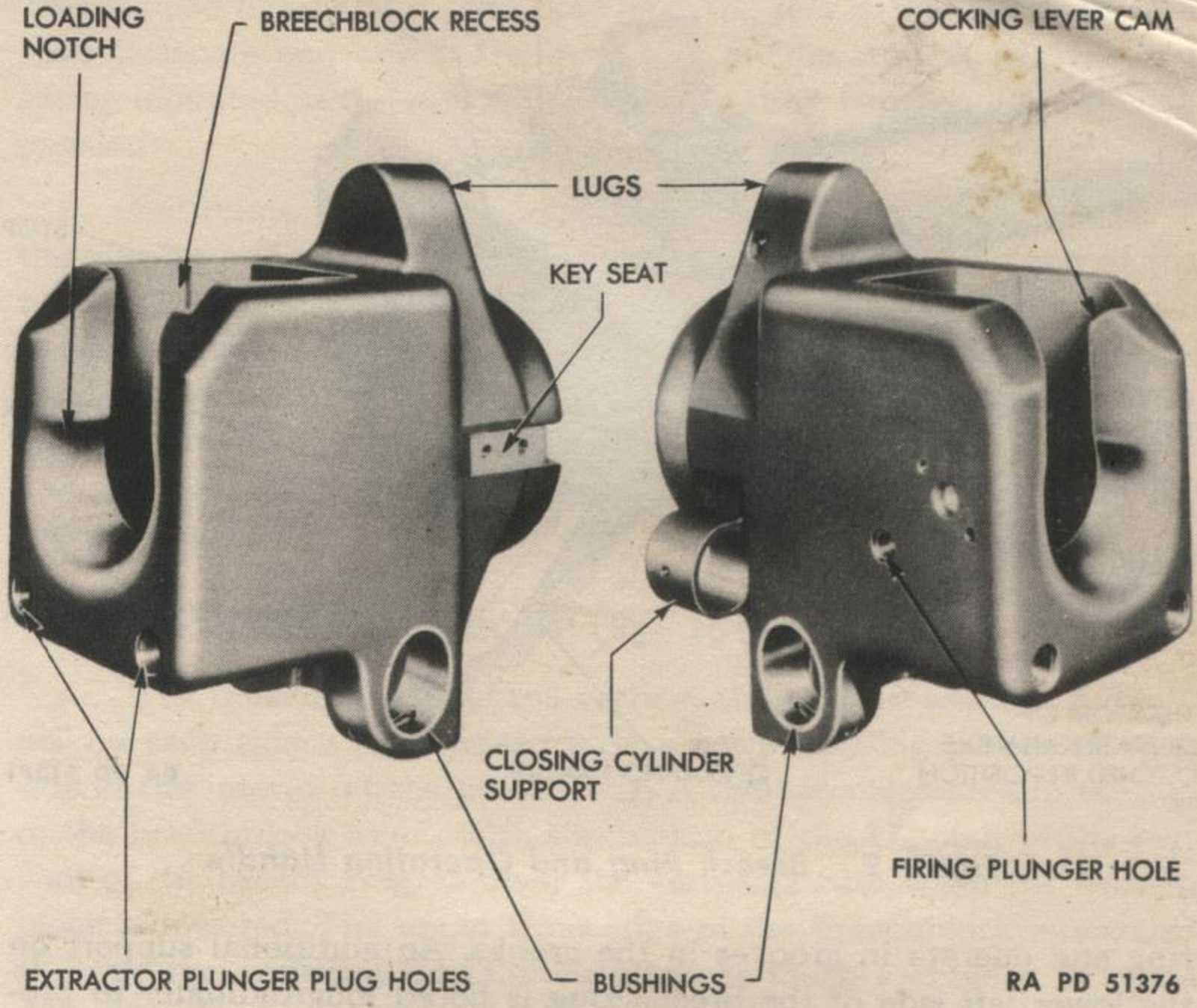

Figure 8 — Breech Ring

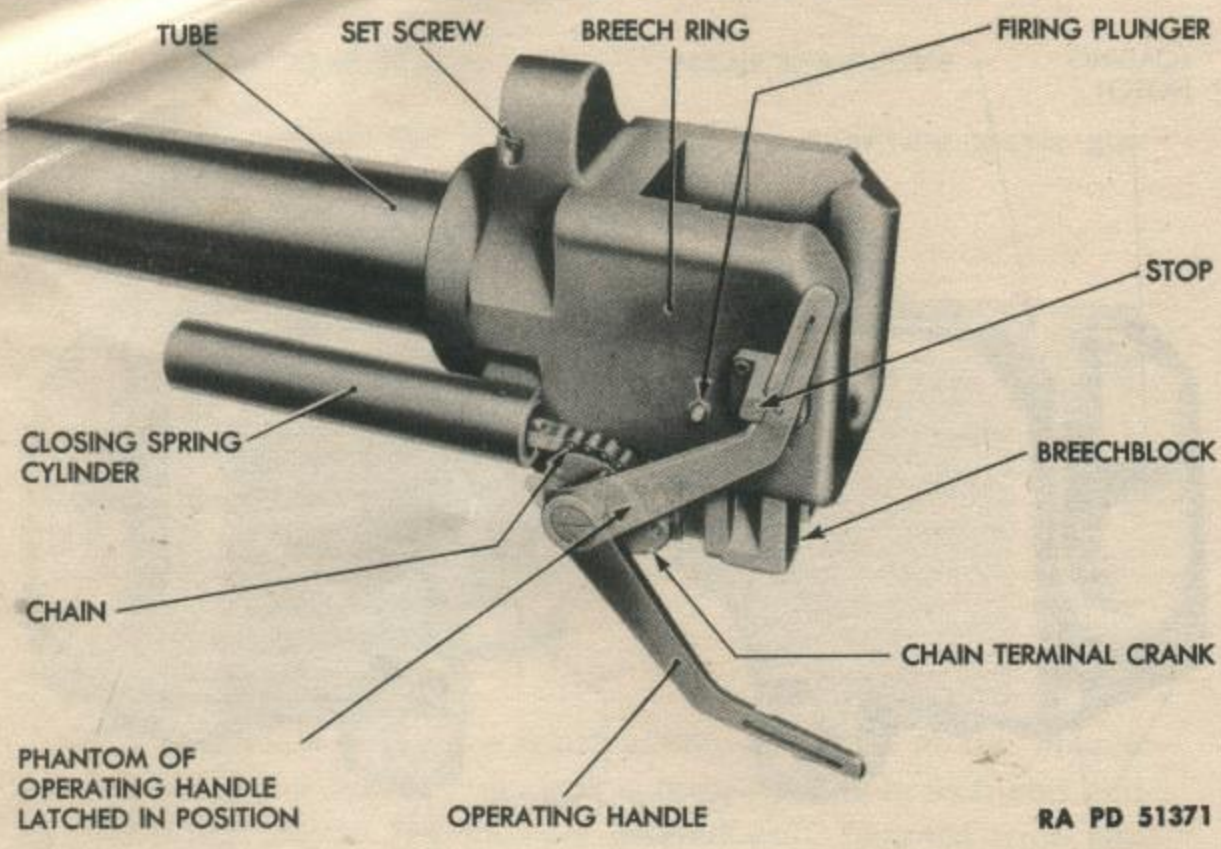

Figure 9 — Breech Ring and Operating Handle

ring and operate in grooves in the cranks. An additional support on the lower left side of the breech ring is bored longitudinally to provide a means of attaching the closing spring cylinder, which is secured in place by two set screws.

c. Near the rear of the breech ring is a rectangular recess which extends through the ring from top to bottom to house and guide the breechblock. The rear side of this recess is cut out at the top to form a U-shaped notch to clear the cartridge case when loading and ejecting. The surface around the U-shaped opening is rounded to facilitate loading the gun (fig. 8). The right rear wall of the breech ring is recessed at the top corner and beveled inward to form a camming surface to actuate the cocking lever. On the inner walls of the breech ring near the front are short curved slots, one on each side, which guide the outer trunnions of the extractors. Two holes in the rear face of the breech ring, extending forward into the extractor trunnion recesses, house the extractor plungers and springs. The rear ends of the holes are threaded to accommodate the extractor plunger plugs.

d. A hole in the left cheek of the breech ring near the center is counterbored and threaded to receive the firing plunger and retainer.

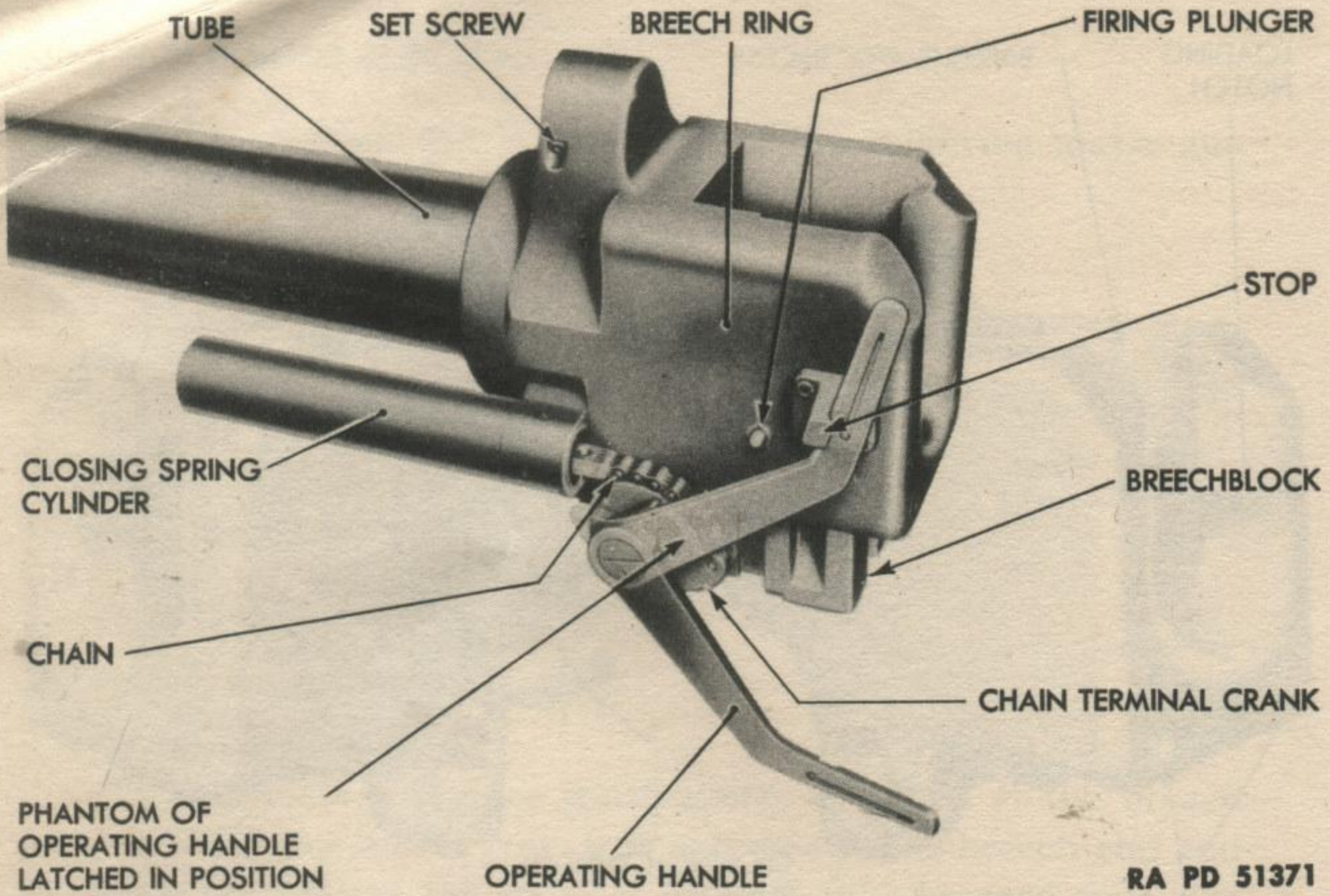

Figure 9 — Breech Ring and Operating Handle

Two tapped holes and a pilot hole near the rear of the left cheek are used to locate and attach the operating handle stop. A plunger and spring mounted in the stop retain the operating handle in the latched position.

e. Function. The breech ring may be considered the housing of the gun. In addition to providing a mounting for the rear end of the tube, it houses and supports the principal operating mechanism, consisting of the breechblock assembly, percussion mechanisms, breechblock crank and cross heads, operating and chain terminal cranks, spline shaft and operating handle, operating handle stop, firing plunger and retainer, extractors, extractor plunger springs and plugs, and the breech ring key.

10. BREECHBLOCK GROUP (figs. 10 and 11).

a. The breechblock is of the vertical sliding type and has a shoulder on each side which slides inside a corresponding groove in each side of the interior of the breech ring. A semicircular notch in the top of the breechblock alines with the bottom of the U-notch in the rear wall of the breech ring, to clear the cartridge case when the breechblock is lowered. The upper front edge of the breechblock is beveled to force the cartridge into the chamber as the breechblock is raised (fig. 10). To accomplish the final chambering of the round as the breech is closed, the rear face and guide shoulders of the breech ring are inclined 1 degree 15 minutes so that the breechblock is cammed forward as it is raised to the battery position. An inclined T-shaped slot in the bottom of the breechblock provides a means of connecting the breechblock crank and cross heads to the breechblock to raise and lower the breechblock assembly.

b. In each side of the breechblock is a groove in which the inner trunnions of the extractors operate (fig. 11). The lower portion of the grooves are parallel with the side faces of the breechblock but the upper ends are so curved that the top of the extractors are cammed rearward to eject the empty cartridge case. Flats on the vertical lands on each side of the breechblock provide a surface against which corresponding flats on the inner trunnions of the extractors contact to lock the breechblock in the open position.

c. A hole bored through the center of the breechblock houses the percussion mechanism. The forward end is counterbored and threaded to receive the breechblock bushing which is retained by a locking screw. The center portion has a longitudinal groove to receive the

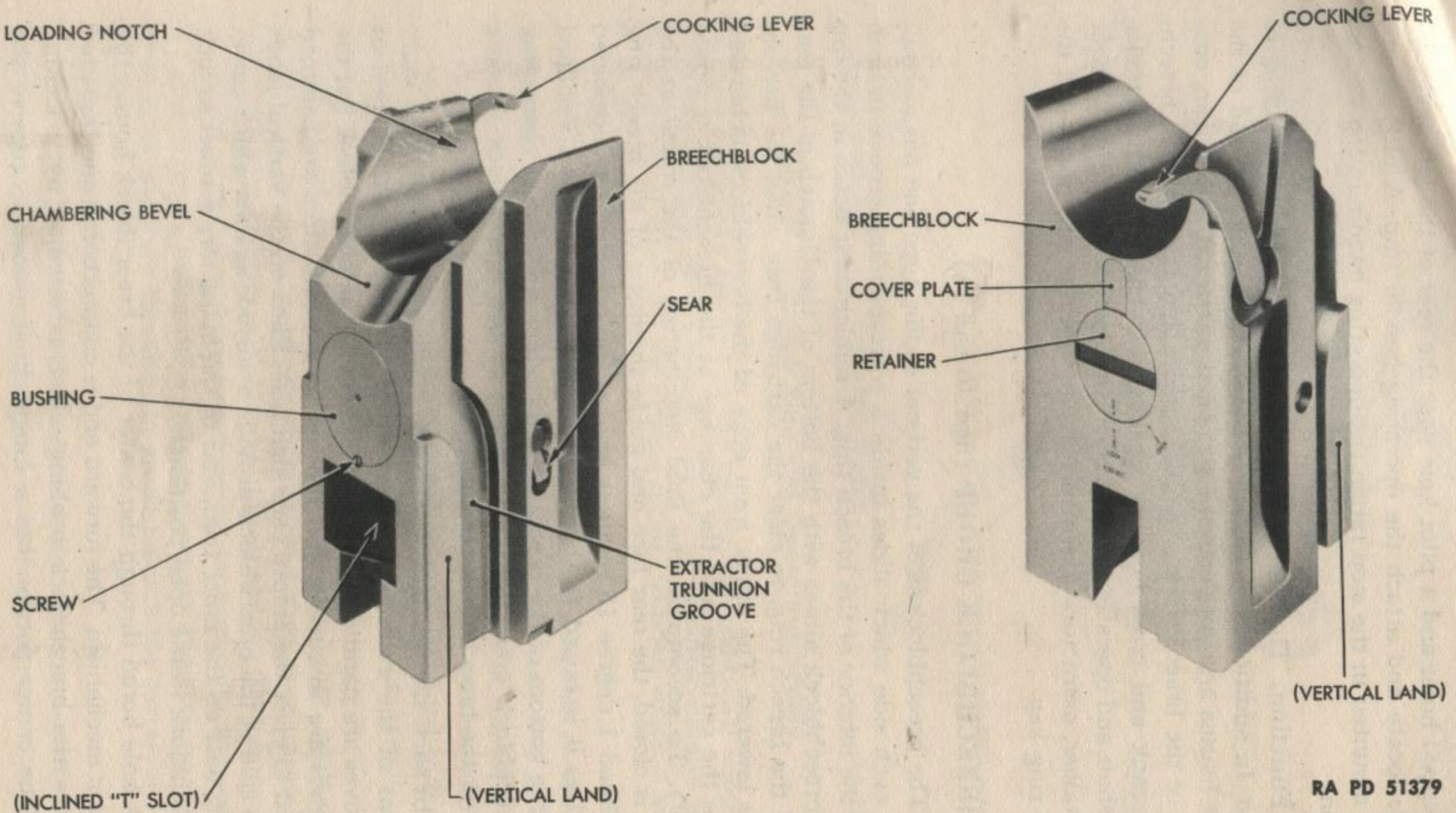

Figure 10 — Breechblock Assembly, 76-mm Gun M1

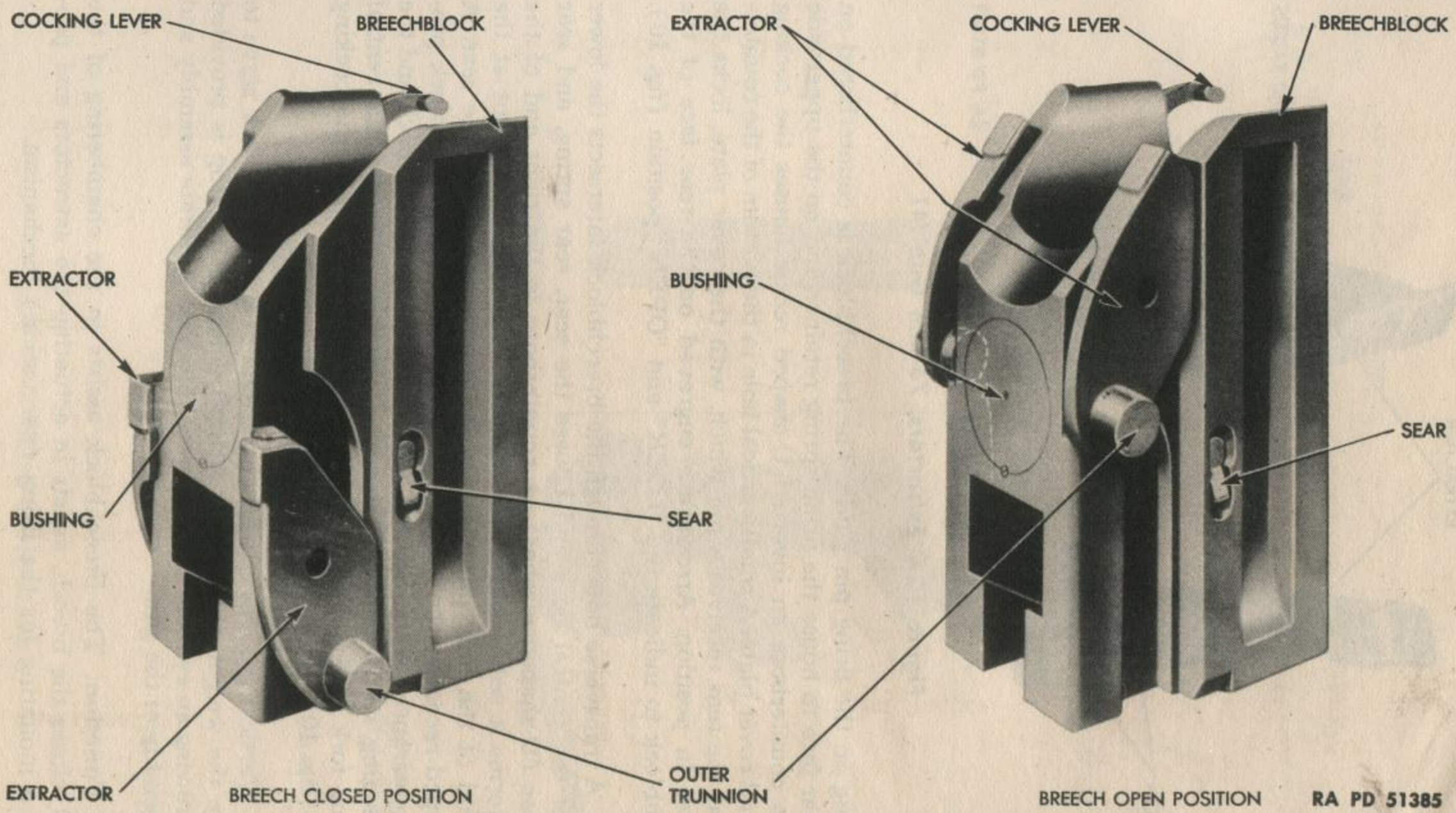

Figure 11 — Breechblock and Extractors

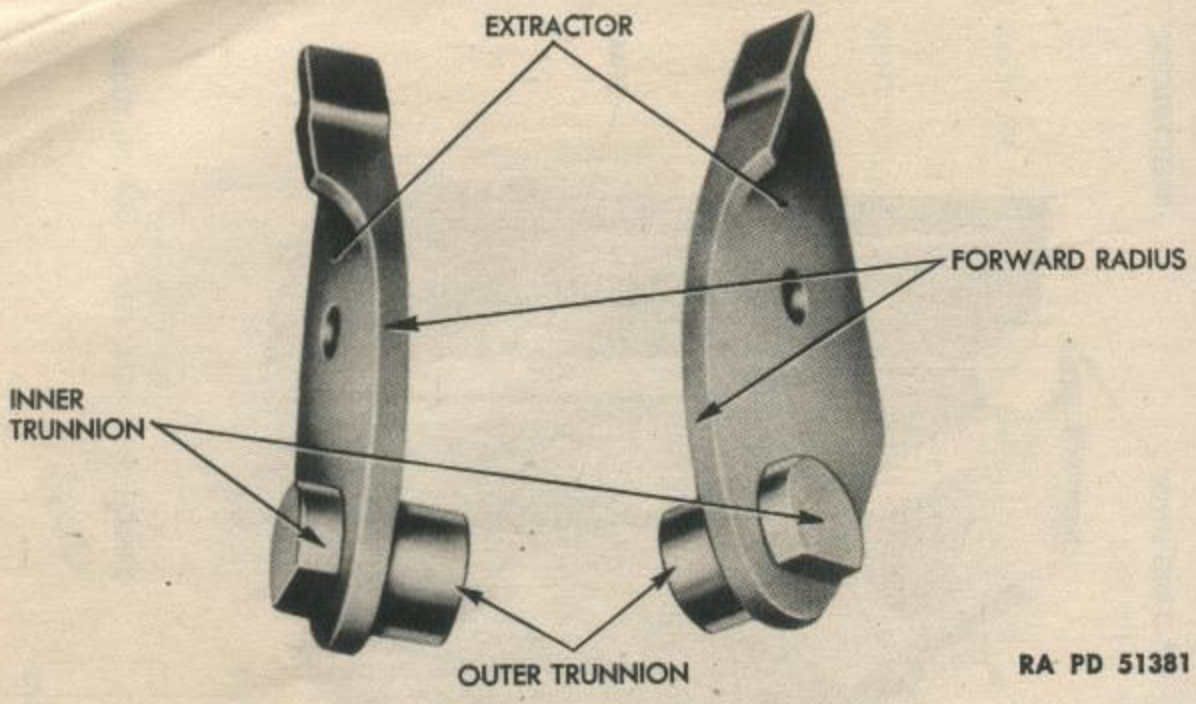

Figure 12 — Extractors, 76-mm Gun M1

sear lug on the firing pin guide. The breechblock is counterbored on the rear face to house the firing spring retainer and on the upper side of this counterbore an inverted U-shaped recess houses the cocking fork and cover plate. A small vertical hole in the bottom of the counterbore at the rear receives a pin which, with the cover plate, locks the retainer in position. Arrows are engraved on the rear face of the breechblock to indicate the "LOCK" and "OPEN" position (fig. 10).

d. A transverse hole through the breechblock intersects the lower side of the central bore and houses the sear, sear spring, and sear retainer (U-shaped washer). A counterbore in the right end of the hole forms a seat for the sear retainer, and the vertical slot at the left end of the hole provides clearance for the arm of the sear. A V-shaped recess in the upper right rear side of the breechblock provides clearance for the cocking lever between the breechblock and the breech ring, while a transverse bore from this recess into the central cocking fork recess serves as a bearing for the shaft of the cocking lever (fig. 10).

e. Vertical grooves cut into each side of the breechblock serve to reduce the weight of the part. A tapped hole in the top is provided for screwing an eyebolt into the breechblock to facilitate assembly and disassembly of the gun.

f. Function. The breechblock assists in the chambering of the round, closes the breech, assists in actuating the extractors and provides a mounting for the firing (percussion) mechanism.

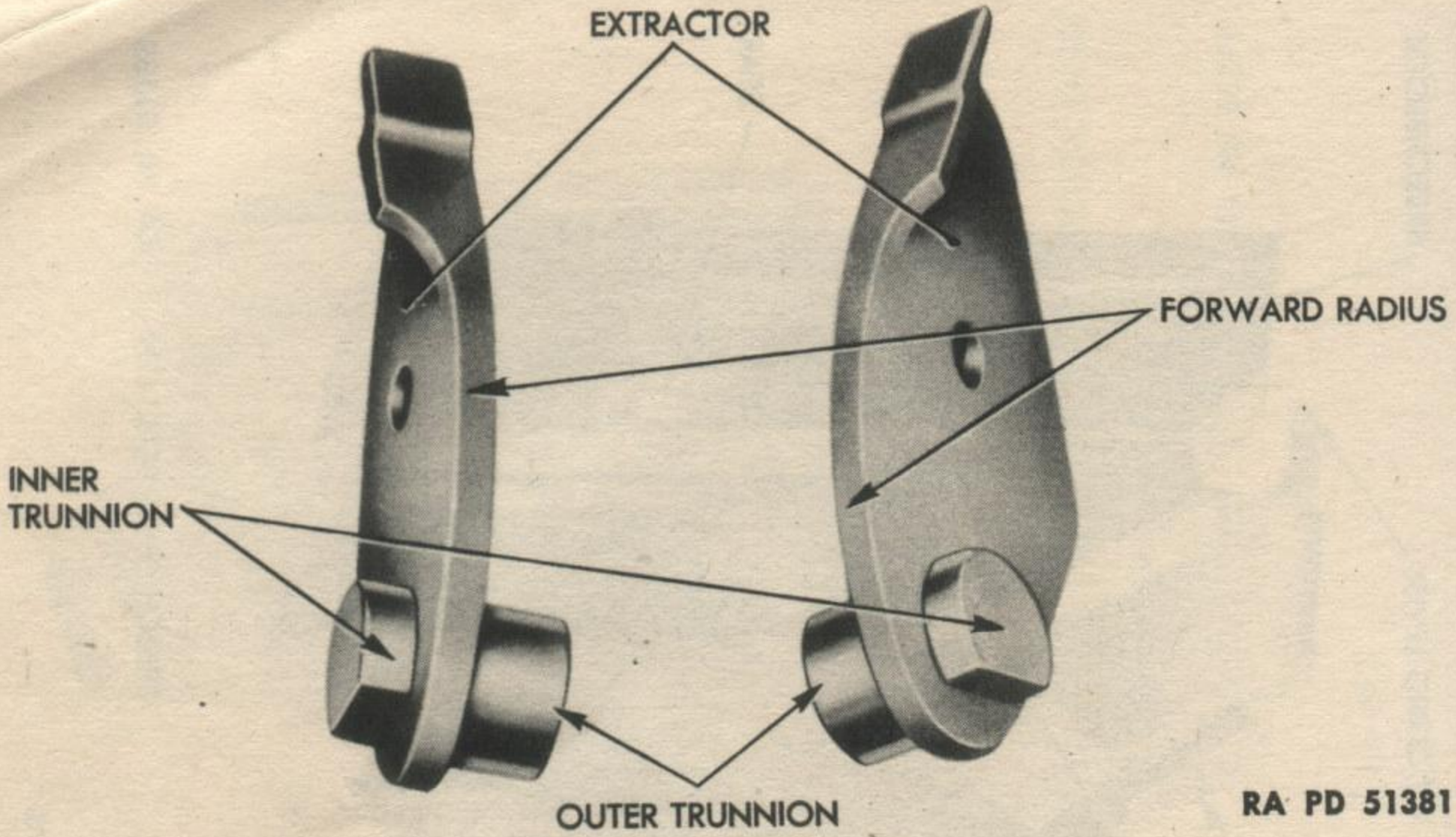

Figure 12 — Extractors, 76-mm Gun M1

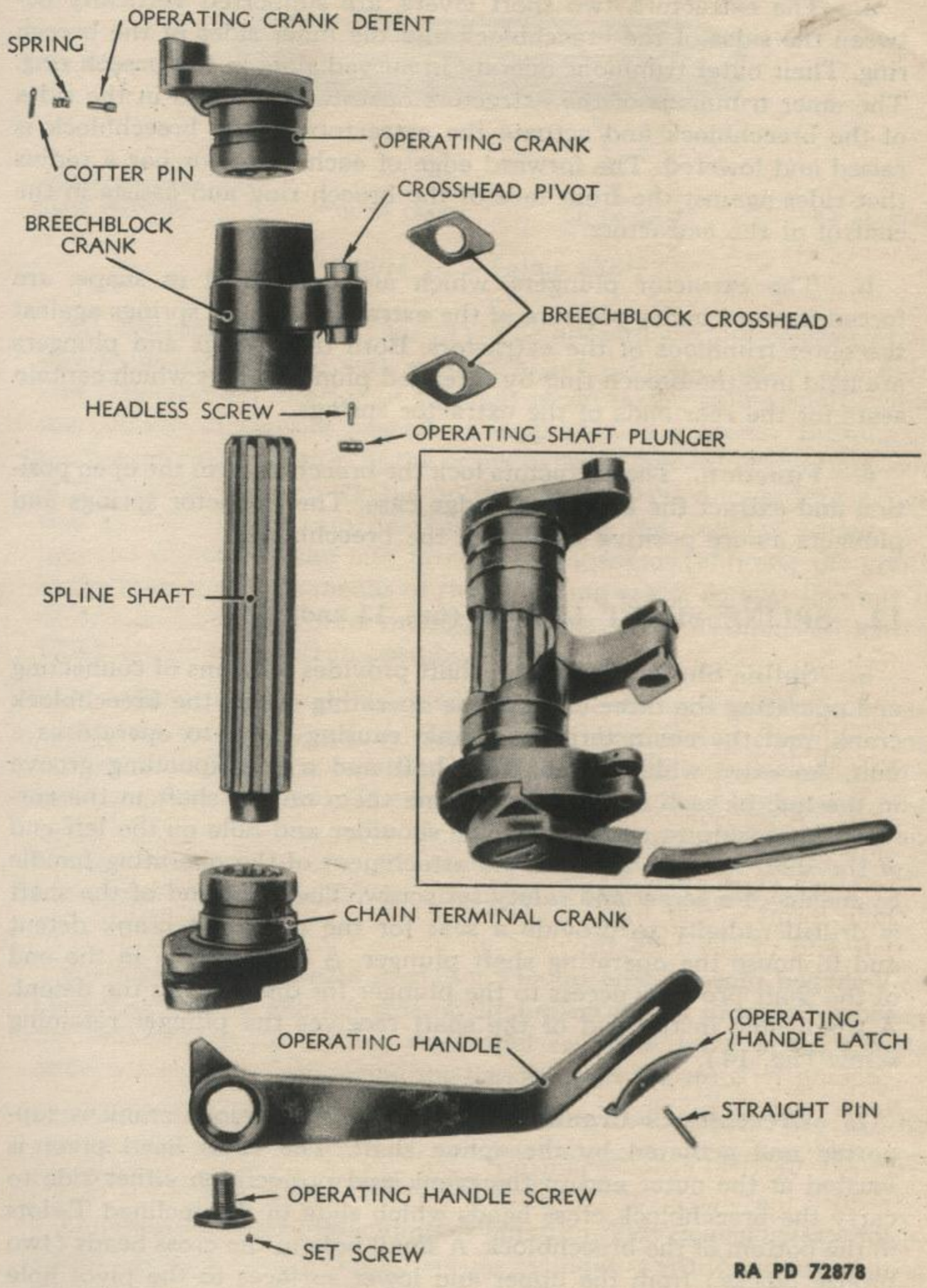

Figure 13 — Spline Shaft Group

11. EXTRACTORS (fig. 12).

a. The extractors, two short levers, are supported vertically between the sides of the breechblock and the inner sides of the breech ring. Their outer trunnions operate in curved slots in the breech ring. The inner trunnions of the extractors operate in grooves in the sides of the breechblock and actuate the extractors as the breechblock is raised and lowered. The forward edge of each extractor has a radius that rides against the front face of the breech ring and assists in the control of the extractors.

b. The extractor plungers, which are cylindrical in shape, are forced forward under pressure of the extractor plunger springs against the outer trunnions of the extractors. Both the springs and plungers are held into the breech ring by threaded plunger plugs which contain seats for the rear ends of the extractor springs.

c. **Function.** The extractors lock the breechblock in the open position and extract the empty cartridge case. The extractor springs and plungers assure positive locking of the breechblock.

12. SPLINE SHAFT GROUP (figs. 13 and 14).

a. **Spline Shaft.** The spline shaft provides a means of connecting and operating the three cranks: the operating crank, the breechblock crank, and the chain terminal crank, causing them to operate as a unit. An extra wide land on the shaft and a corresponding groove in the hub of each of the cranks aline them on the shaft in the correct relationship to each other. The shoulder and hole on the left end of the shaft are provided for the attachment of the operating handle by means of a screw and safety set screw. The right end of the shaft is drilled radially to provide a seat for the operating crank detent and to house the operating shaft plunger. A central hole in the end of the shaft provides access to the plunger for disengaging the detent. A small hole in the end of the shaft receives the plunger retaining screw (fig. 14).

b. **Breechblock Crank** (fig. 13). The breechblock crank is supported and actuated by the spline shaft. The cross head pivot is located at the outer end of the crank and projects on either side to carry the breechblock cross heads which slide in the inclined T-slots in the bottom of the breechblock. A small hole in the cross heads (two bronze blocks) from the upper and lower surfaces to the pivot hole provide for the passage of lubricant. An arrow and the words "Muzzle Face" are engraved on each cross head to avoid installing the parts improperly.

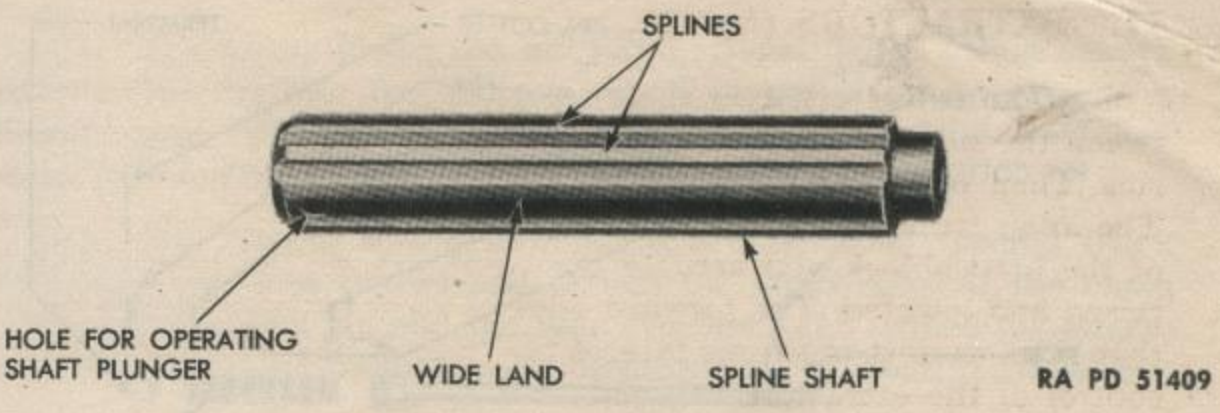

Figure 14 — Spline Shaft

c. Operating Crank (fig. 13). The operating crank consists of an internally splined hub with a short heavy arm and lug on the right end. The splined interior of the hub receives the spline shaft, while the cylindrical exterior surface is supported in a bronze bushing in the breech ring. The arm of the crank extends upward at the right side of the breech ring and the lug on the arm projects outward for actuation by the ejector cam on the gun mount. An annular groove cut into the exterior of the hub provides a means of retaining the crank in the breech ring by means of the operating crank detent. The hub is drilled and counterbored radially to receive the detent and spring which secure the shaft in position.

d. Chain Terminal Crank (fig. 13). The chain terminal crank consists of an internally splined hub with a short heavy crank arm on its left end. The arm is slotted and drilled for attachment of the closing spring terminal. The splined interior of the hub receives the spline shaft, while the cylindrical exterior is supported in a bushing in the transverse bore of the breech ring. An annular groove is cut into the exterior of the hub for engagement by the detent which retains the crank.

e. Operating Handle (fig. 13). The operating handle mounted on the spline shaft at the left side of the breech ring is provided to lower the breechblock for loading the initial round. A latch in the handle offers a means of disengaging the handle from the stop.

CAUTION: Immediately after lowering breechblock, the handle should always be returned to the latched position against the stop to avoid personal injury and damage to parts.

f. Closing Spring Mechanism (fig. 15). The closing spring mechanism operates in the closing spring cylinder which is mounted in a support on the lower left side of the breech ring just ahead of the chain terminal crank. The spring piston rod is attached to the chain terminal crank by means of the closing spring chain which draws the piston rearward against the closing spring when the breech is opened.

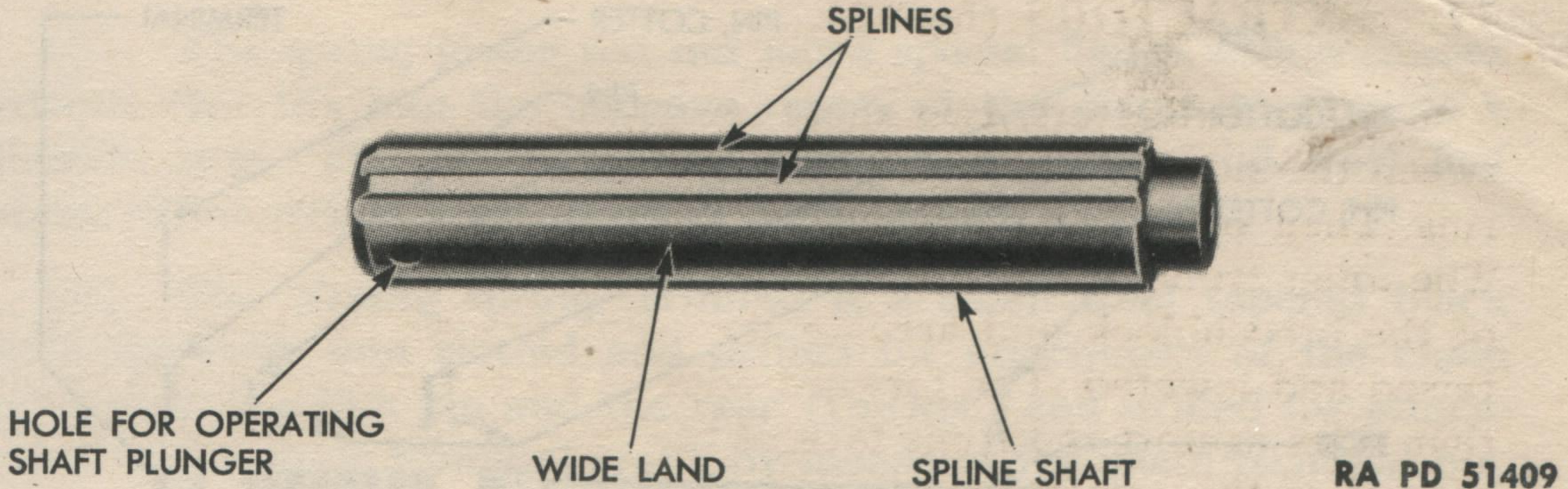

Figure 14 — Spline Shaft

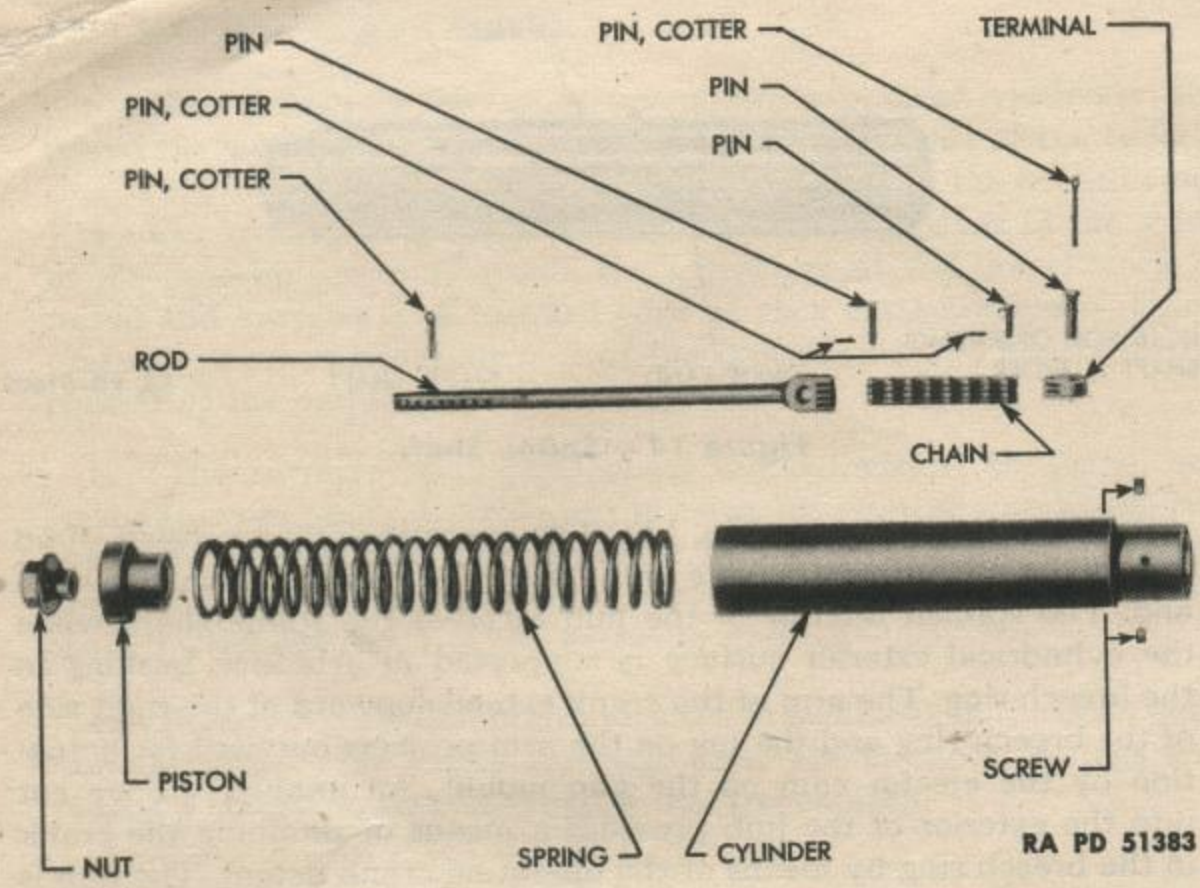

Figure 15 — Closing Spring, Rod, and Cylinder

(1) The closing spring cylinder is a tube which encloses the closing spring and piston and has a shoulder at the rear end to fit into a support on the breech ring. It is secured with two screws. A shoulder inside the cylinder near the rear end forms a seat for the closing spring.

(2) The spring piston rod is slotted and drilled at one end for attachment of the closing spring chain by means of a link pin. Near this end another hole is drilled through the rod to permit the insertion of the closing spring retaining tool used in assembly and disassembly. A series of equally spaced holes is drilled in the threaded portion of the front end of the rod so that the piston rod nut can be properly adjusted and secured by means of a cotter pin (fig. 15).

(3) The closing spring piston fits into the closing spring cylinder freely. A hole through the center of the bronze piston provides a loose fit on the spring piston rod. A concave recess at one end forms a seat for the piston rod nut, while the shoulder at the front end provides a seat for the closing spring.

(4) The closing spring is a heavy helical compression spring with a free height of 15 inches (approximately).

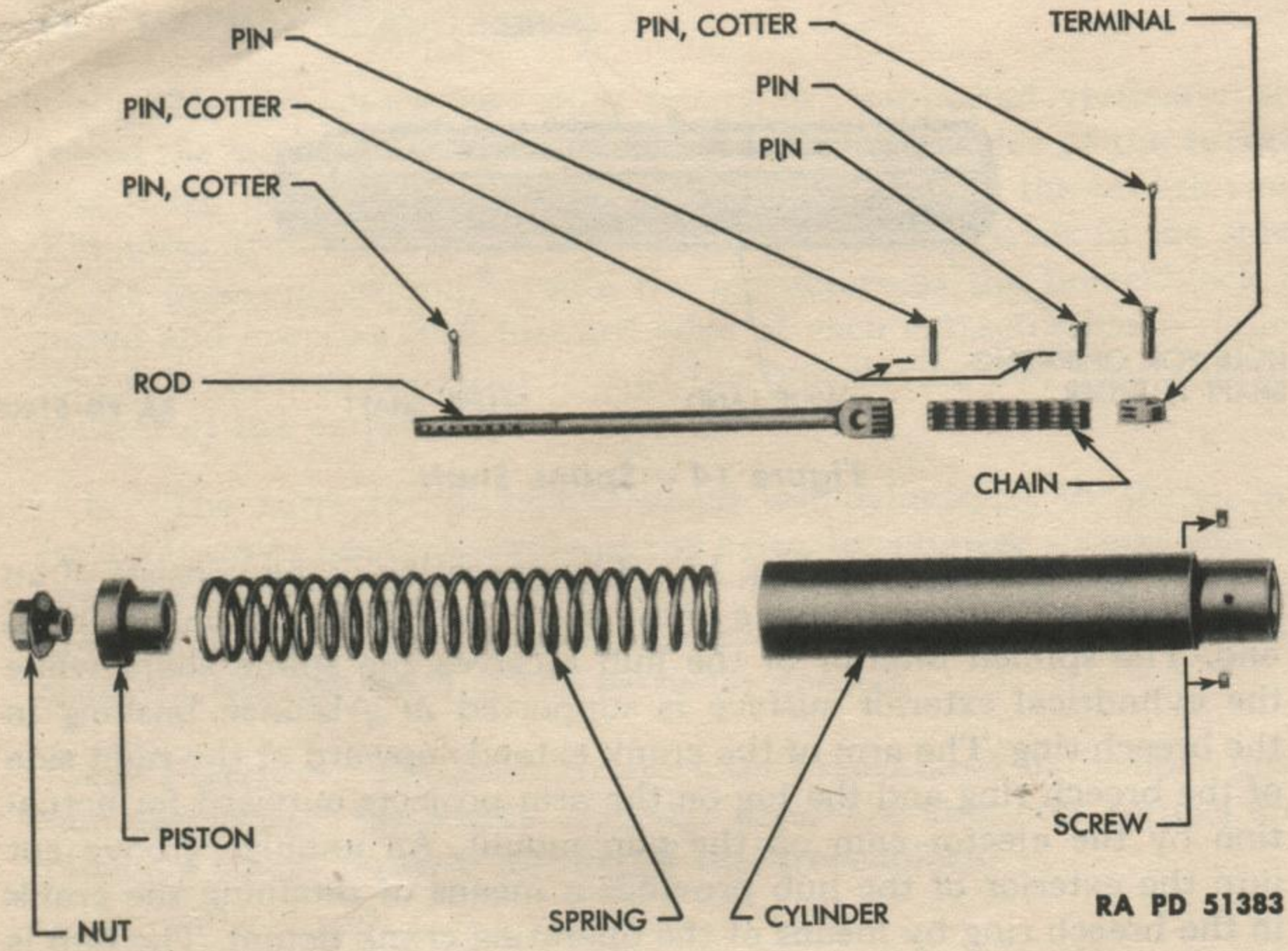

Figure 15 — Closing Spring, Rod, and Cylinder

(5) The spring piston rod nut has a special flange with a convex surface that fits into the concave recess of the piston to provide a flexible joint. The closing spring chain is a commercial steel leaf chain with a minimum strength of 5,500 pounds (fig. 15).

(6) The closing spring terminal is a small steel tapered block with the front end slotted and drilled for attachment of the chain by means of a link pin and the rear (thicker) end drilled for attachment to the chain terminal crank by means of the chain terminal pin.

g. Function. The breechblock crank connects the spline shaft to the breechblock to open and close the breech by rotation of the spline shaft. The operating crank opens the breech automatically during counterrecoil by rotation of the spline shaft caused by engagement of the crank with a cam on the mount. The chain terminal crank provides a means of connecting the closing spring mechanism to the spline shaft to close the breech under closing spring force.

13. PERCUSSION AND FIRING MECHANISM (figs. 16, 17).

a. Percussion Mechanism and Control. The firing pin guide is a cylindrical cup which slides fore and aft in the central bore of the breechblock, with the closed end forward. It contains the firing pin, firing pin retracting spring, firing pin guide pin, firing spring stop, and the forward end of the firing spring. The larger of the two exterior lugs on the lower side of the guide serves for engagement with the sear, while the smaller lug near the front acts as a guide in the groove of the breechblock bore. Two lugs on the rear of the guide extend outward so that the cocking fork engages them and thus actuates the guide to cock the gun.

b. Firing Pin (fig. 16). The firing pin is a shouldered screw with a slotted head and a small cylindrical point ground square. It is screwed into the front end of the guide from the rear and secured by the firing pin guide pin which is inserted through a hole in the firing pin and guide.

c. Firing Spring Stop (fig. 17). The firing spring stop is a ring with two projections protruding from its front face which fit freely in two openings in the front end of the firing pin guide. The firing spring stop retains the firing pin guide pin.

d. Firing Pin Retracting Spring (fig. 16). The firing pin retracting spring is a light helical compression spring mounted on the body of the firing pin. It bears against the head of the firing pin and forward on the firing spring stop, pressing the stop against the forward end of the guide.

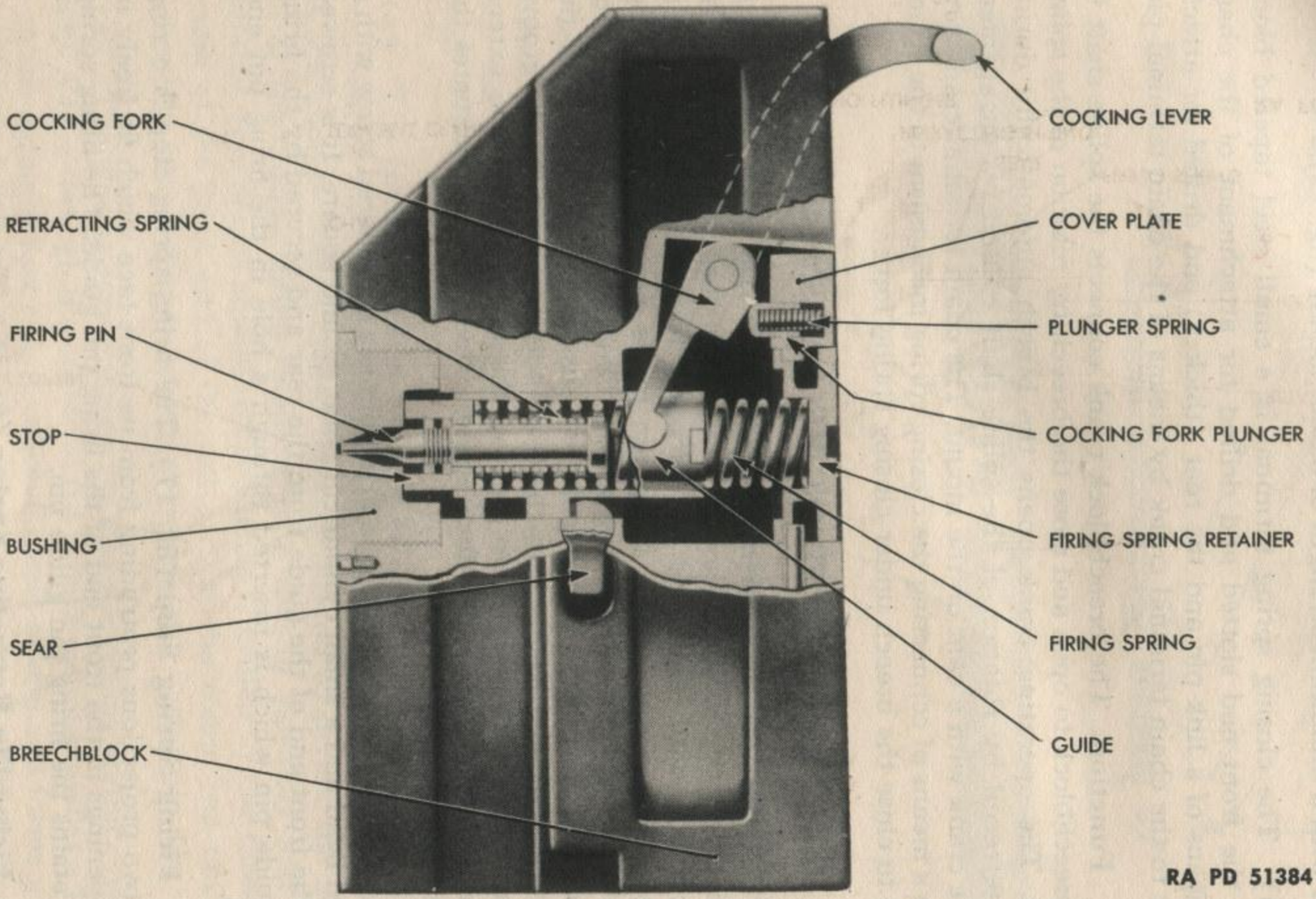

Figure 16 — Percussion Mechanism

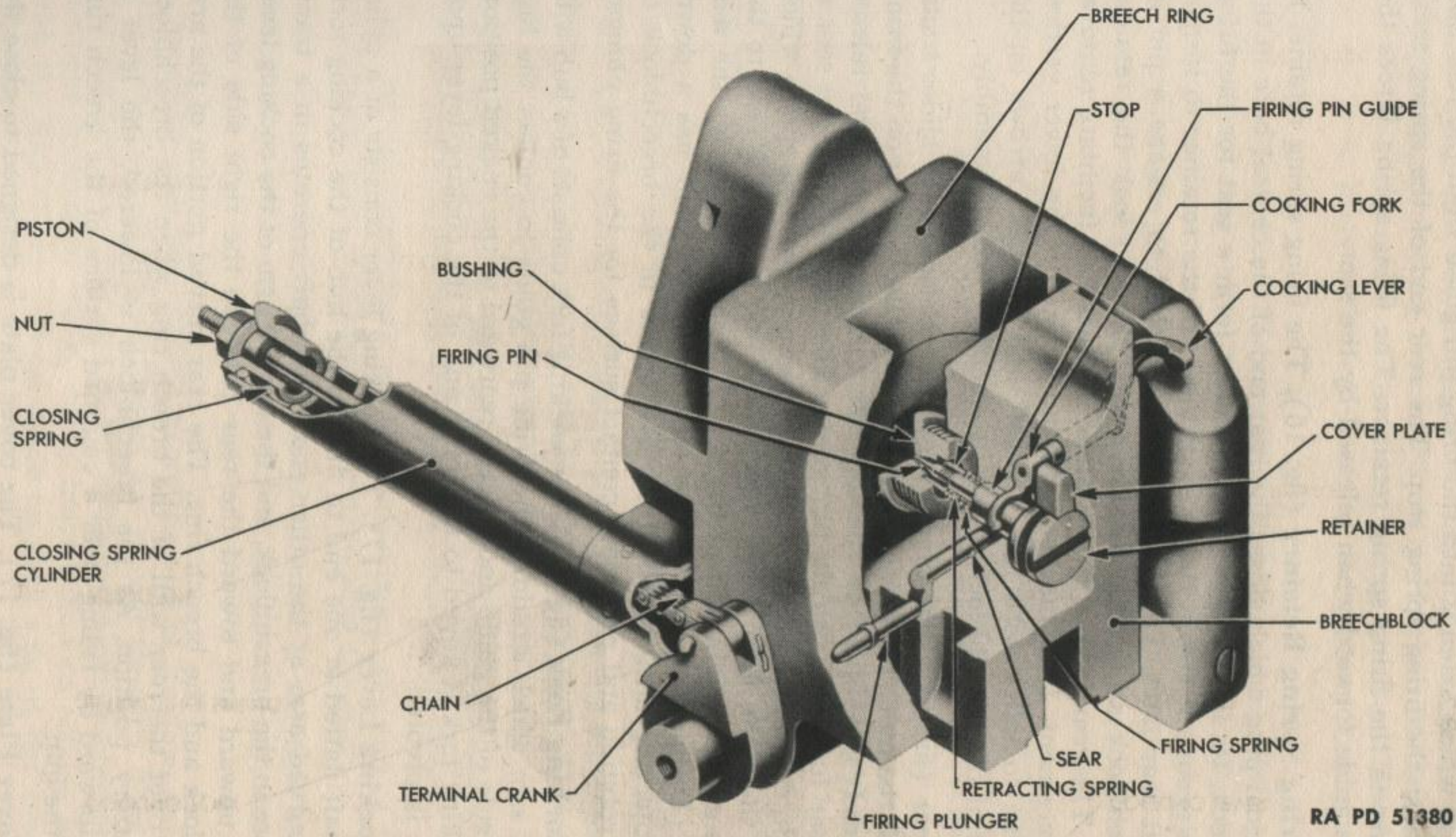

Figure 17 — Breech Mechanism, 76-mm Gun M1

e. Firing Spring (fig. 16). The firing spring is a helical compression spring which extends into the firing pin guide from the rear and rests against the firing spring stop. The rear end of the spring seats in a recess in the firing spring retainer. The firing spring forces the firing pin guide forward when released by the sear.

f. Firing Spring Retainer (fig. 16). The firing spring retainer is a cylindrical plug which closes the rear end of the central bore in the breechblock. Its forward end is recessed to form a seat for the firing spring. A groove is cut in the circumference of the retainer to form a front and rear land. The front land is notched to engage a pin in the breechblock and a lug on the cover plate to lock the retainer in place. The rear face of the retainer is slotted to facilitate removal and replacement. It is marked with an arrow on the lower vertical center line to index with the "OPEN" and "LOCK" arrows on the rear face of the breechblock to aid in assembly and disassembly.

g. Sear (fig. 17). The sear is a cylindrical bar which slides transversely in the breechblock across the path of the sear lug on the firing pin guide. It is notched on the top side for engagement and release of the sear lug on the firing pin guide. The right end of the sear is reduced in diameter to receive a helical compression sear spring which seats on the right side of the breechblock and forces the sear to the left. The extreme right end of the sear is grooved to receive the sear retainer (U-shaped washer). The left end of the sear has a downward projecting arm which fits into a recess in the breechblock to prevent rotation and provide a contact surface for the firing plunger.

h. Cocking Fork (fig. 16). The cocking fork consists of a hub with a forked arm which straddles the firing pin guide to contact the lugs on each side of the guide and force it rearward to the cocked position. The cocking fork is keyed to the inner end of the cocking lever upon which it is pivoted.

i. Cocking Lever (fig. 17). The cocking lever consists of a cylindrical shaft flatted at one end to fit into the hub of the cocking fork, with a curved arm at the other end. The shaft operates in a transverse bore in the breechblock, and the curved arm of the cocking lever extends upward and toward the rear between the right side of the breechblock and the breech ring. The rear curved portion of the arm extends over the rear wall of the breech ring when the breechblock is in battery position. As the breechblock is lowered, the lever is rotated forward by riding over a cammed surface of the breech ring to cock the gun.

j. Cover Plate (fig. 17). The cover plate is designed to close the rear opening of the breechblock recess above the firing spring retainer. A curved portion at the top fits the recess and a concave lower edge

rests against the firing spring retainer. Flanges on both sides of the cover engage grooves on the inner wall of the recess in the breechblock. A lug projecting downward on the bottom of the cover plate retains the upper side of the firing spring retainer. The front face of the cover plate is drilled to house the cocking fork plunger and spring.

k. Cocking Fork Plunger (fig. 16). The cocking fork plunger is a cylindrical plug which presses forward on the lower side of the cocking fork hub to return the cocking fork and lever as the cocking lever is released. The plunger is drilled to receive the cocking fork plunger spring which rests against the cover plate and presses forward on the plunger.

l. Firing Plunger (fig. 17). The firing plunger is cylindrical in form with an integral collar near its middle. It is retained in a bored hole in the left side of the breech ring. Its flat inner end is alined with the arm of the sear when the breechblock is in the closed position. Its rounded outer end projects from the breech ring so that it can be operated by the firing mechanism on the mount. The plunger is held in the breech ring by the firing plunger retainer.

m. Function. The percussion mechanism and its control actuate the firing pin to fire the round.

14. FUNCTIONING OF 76-MM GUN M1 (figs. 10, 16, 18, and 19).

a. The following step-by-step description covers a complete firing cycle of the gun and starts with the breechblock up (breech closed) and the cartridge chamber empty.

b. Rotation of the operating handle toward the rear of the gun manually lowers the breechblock, thus opening the breech.

c. As the breechblock is moved downward, the end of the firing pin cocking lever is cammed forward, cocking the gun.

d. As the breechblock continues downward, the tops of the two extractors (one mounted in each side of the breech ring) are cammed backwards.

e. When the breechblock nears the end of its downward travel, the lower ends of the extractors are moved forward. This forward movement of the lower end of the extractors locks the breechblock in the open position by means of the inner trunnions coming in contact with the flats of the vertical lands on each side of the breechblock (fig. 10).

f. The breech is now open and the gun is cocked and ready to load.

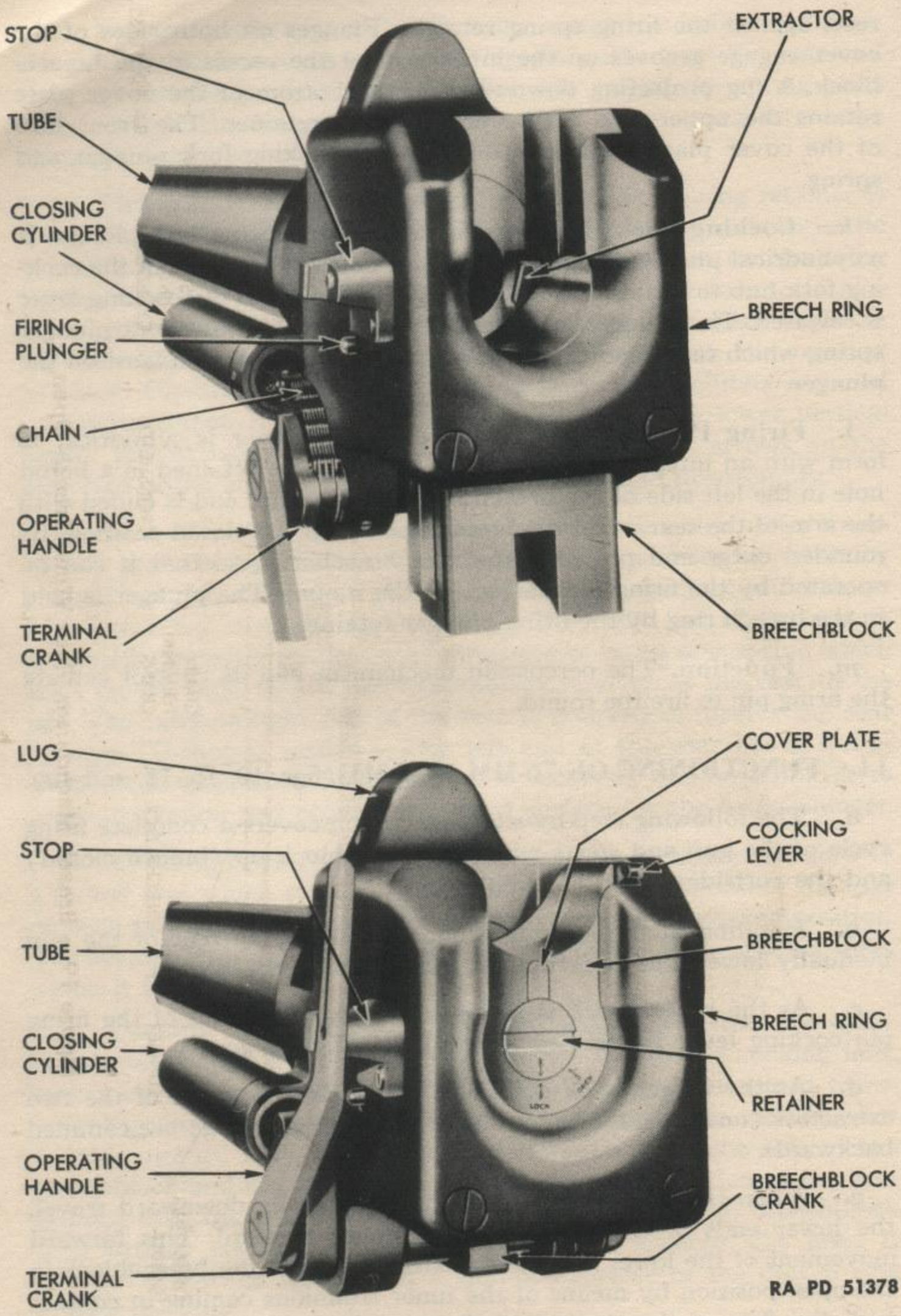

Figure 18 — Breech Open and Closed Positions

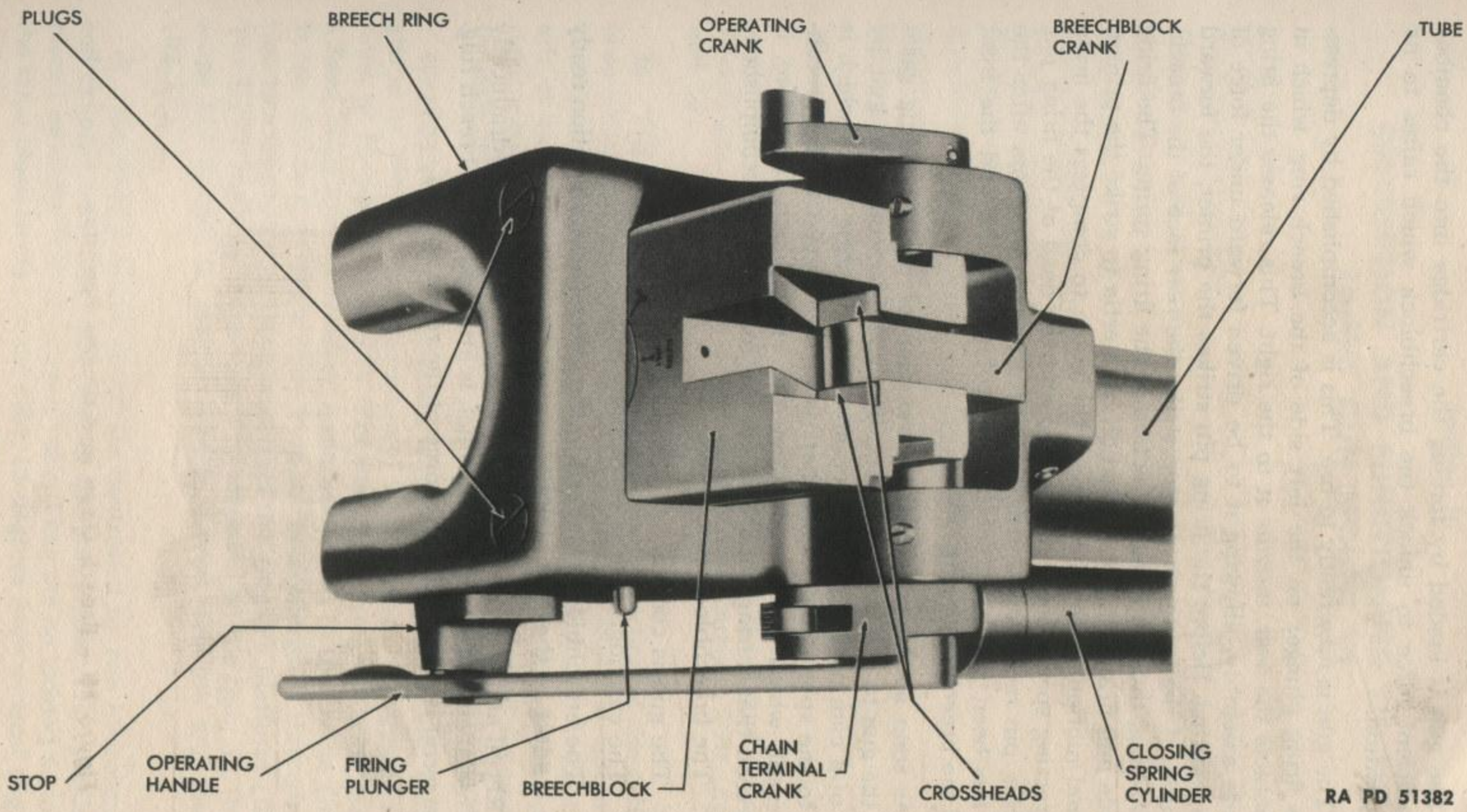

Figure 19 — Breech Mechanism, Rear View, Breech Open

g. The gun is loaded by forcing the cartridge into the chamber with sufficient force to unlock the breechblock which raises to its closed position.

h. The gun is now ready to fire. This is accomplished by depressing the firing plunger on the left side of the breech ring, which in turn contacts the sear, moving it to the right. This releases the firing pin guide assembly, allowing it to be driven forward under force of the firing spring. Before the firing pin strikes the primer, the forward projections of the firing spring stop strike the rear face of the breechblock bushing, thus stopping the action of the firing spring. The firing pin guide and firing pin are carried on by inertia to strike the primer. This final motion forces the stop in the guide to compress the firing pin retracting spring between the stop and the head of the firing pin. The firing pin retracting spring then returns the firing pin after the round has been fired, so that it does not project beyond the front face of the breechblock (fig. 16).

i. As soon as the gun fires, the reaction of the expanding gases causes the gun to recoil in its mount. The counterrecoil of the gun, by means of a cam on the mount, actuates the operating crank which is keyed to the spline shaft. This shaft is in turn keyed to the breechblock crank which opens and closes the breechblock. Therefore, it can be seen that during counterrecoil, the following is accomplished:

(1) The breechblock is lowered.

(2) The gun is cocked.

(3) The cartridge case is extracted.

(4) The breechblock is locked in the lower (open) position ready for the loading of the next round.

j. Recoil and counterrecoil of the gun are controlled hydraulically by the recoil cylinder mechanism which is attached to the breech ring. Counterrecoil is effected by the force of the recoil springs.

Section III

DESCRIPTION AND FUNCTIONING OF THE 76-MM GUN MOUNT T1

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General	15
Major mount groups	16
Gun shield and mounting plate	17
Rotor assembly	18
Gun cradle	19
Recoil cylinder assemblies	20
Elevating mechanism group	21
Firing mechanism group	22
Ejector cam group	23
Recoil guard assembly	24
Periscope drag link group	25

15. GENERAL.

a. The T1 Gun Mount is designed to support and control the 76-mm gun in the turret of the Gun Motor Carriage T70 (figs. 1, 2, and 20).

b. The mount is located in the forward portion of the turret and is so constructed and attached as to permit the gun and mount to traverse as a unit with the turret. The turret can be operated either manually or automatically and is designed to traverse to the left or to the right a full 360 degrees. The turret can be traversed automatically through 360 degrees in either direction in approximately 17 seconds.

c. The elevating mechanism is manually operated and allows the gun to be elevated to a maximum of 20 degrees and depressed a maximum of 10 degrees (fig. 21). The gun is fired manually by means of a hand firing lever pivoted on a pin assembled to the cradle (fig. 23). It can also be fired electrically by a solenoid energized through operation of a foot firing pedal mounted on the gunner's platform (fig. 42). The Direct Sighting Telescope T76 mounted on the rotor, or the Periscope M4 is used to lay the gun in correct azimuth and elevation (fig. 22).

d. Recoil and counterrecoil are controlled by two hydrospring recoil cylinder assemblies attached to the gun cradle. The cylinders are placed on either side of the gun tube. They are so located as to be on the same plane as that of the tube, 45 degrees from vertical (fig. 4).

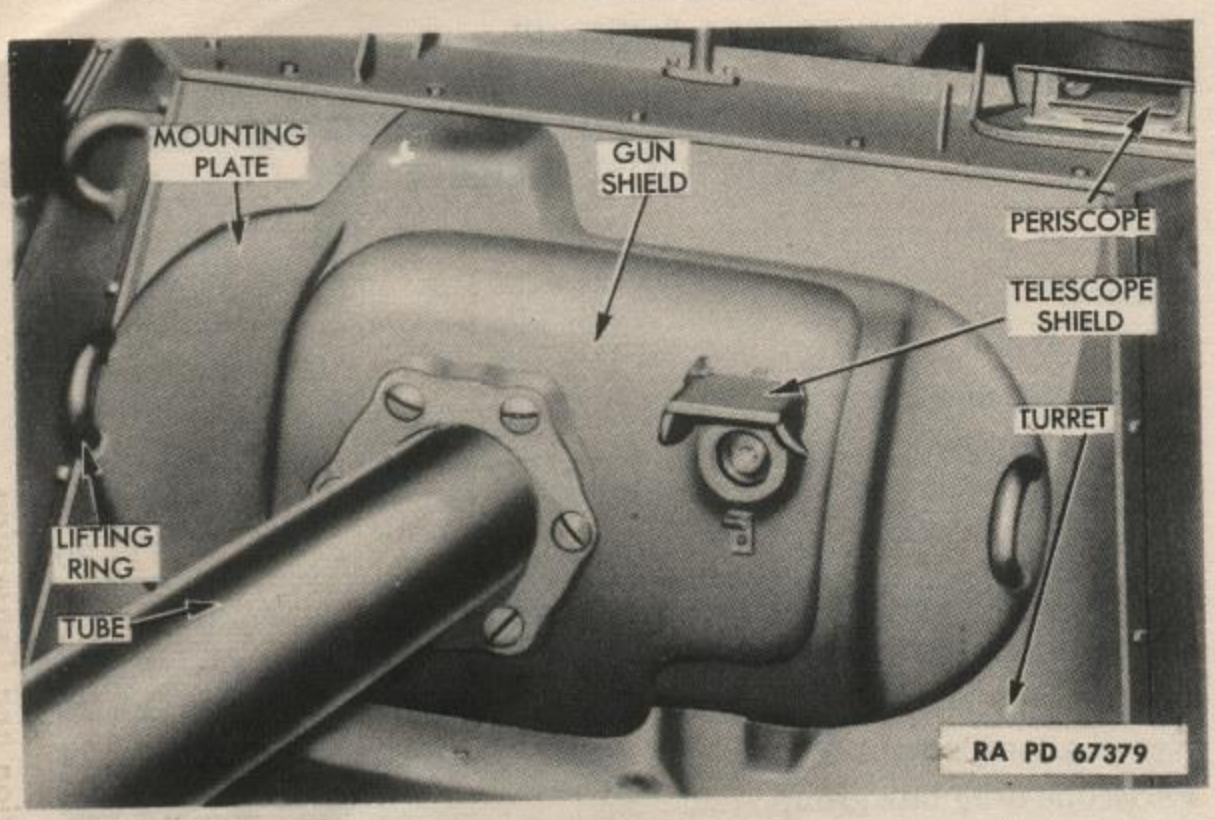

Figure 20 — 76-mm Gun M1 and Mount T1 Installed

16. MAJOR MOUNT GROUPS.

a. The Gun Mount T1 consists of the following major groups:

(1) Gun shield and mounting plate (fig. 20).
(2) Rotor assembly (fig. 23).
(3) Gun cradle (fig. 23).
(4) Recoil cylinder assemblies (fig. 24).
(5) Elevating mechanism group (fig. 26).
(6) Firing mechanism (fig. 27).
(7) Ejector cam group (fig. 29).
(8) Recoil guard assembly (fig. 30).
(9) Periscope drag link group (fig. 31).

17. GUN SHIELD AND MOUNTING PLATE (fig. 20).

a. The gun shield is a curved, rectangular shaped steel plate attached to the rotor assembly by six screws. A round hole near the center of the shield accommodates the gun tube while a smaller hole at the upper left side provides an opening for the telescope.

b. The mounting plate is a heavy, curved, oval shaped casting. It is attached to the turret by screws. A large rectangular opening near the center of the plate provides a means for attaching the gun shield

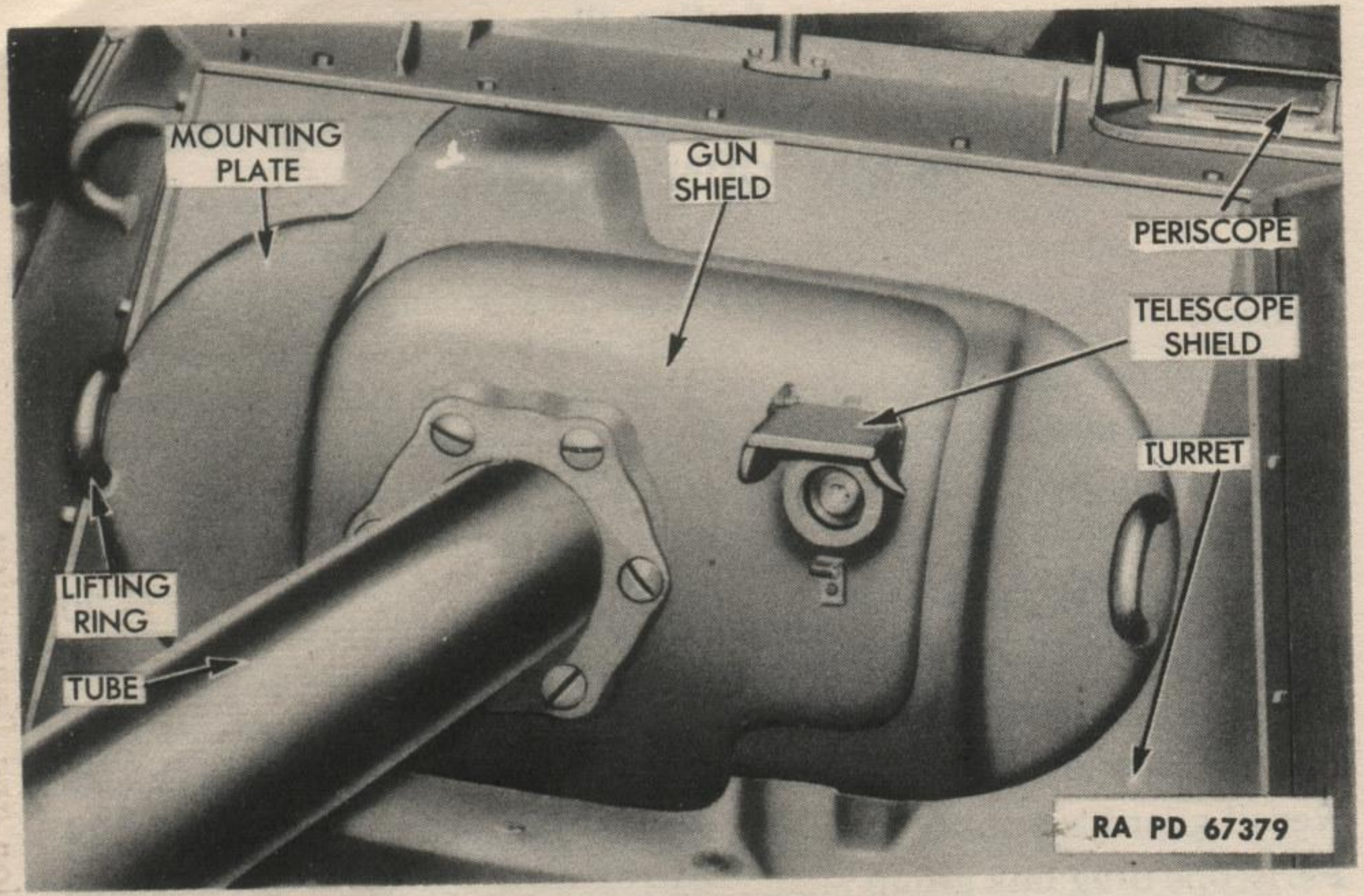

Figure 20 — 76-mm Gun M1 and Mount T1 Installed

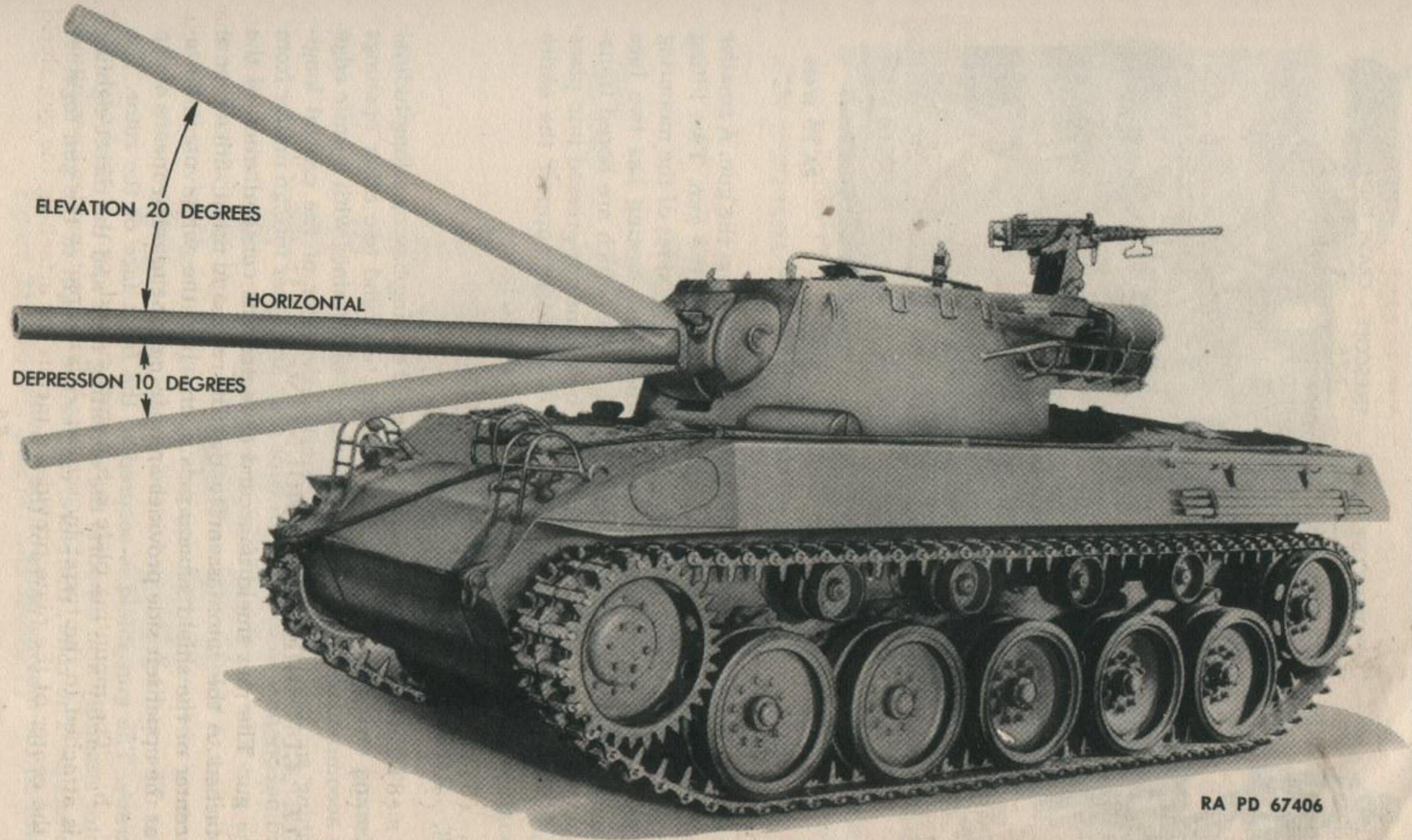

Figure 21 — 76-mm Gun, Maximum Elevation and Depression

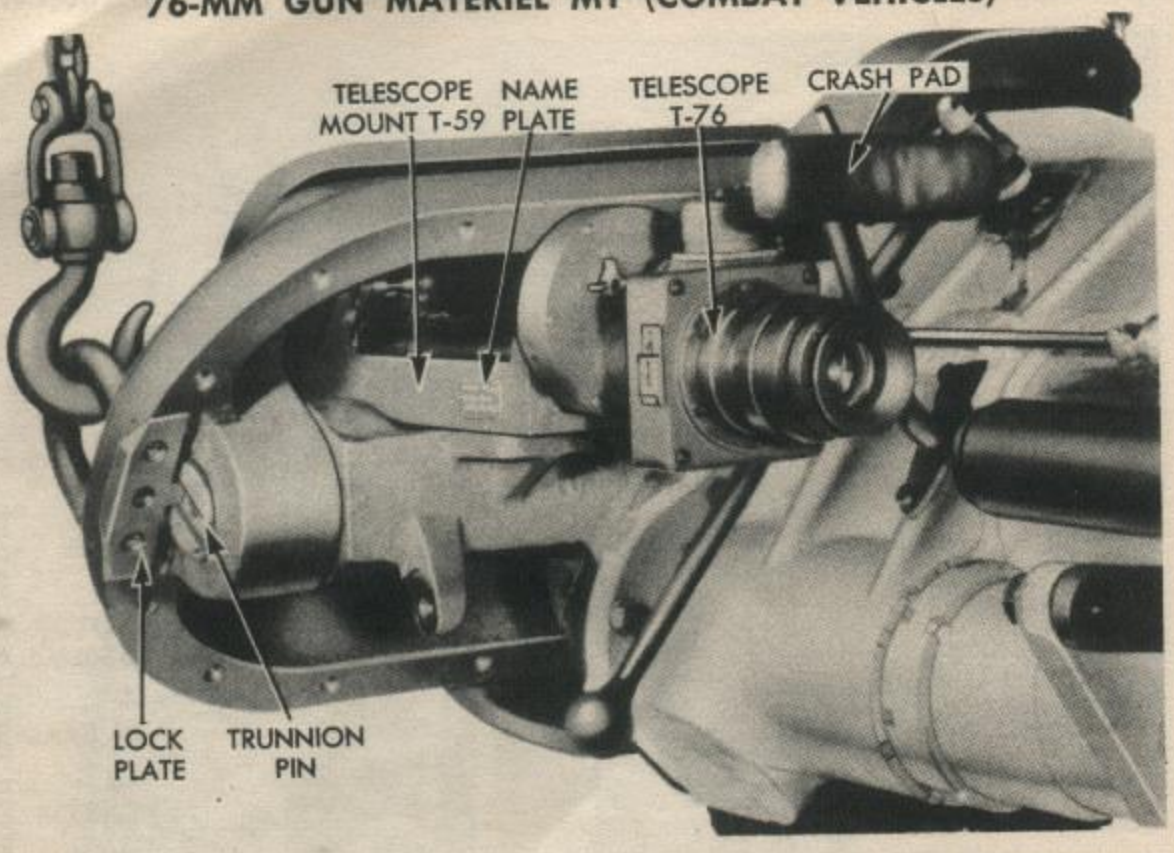

Figure 22 — Telescope Installed

to the rotor and for clearance to elevate and depress the gun. A smaller opening at the left side is provided for sighting the gun. Two lifting hooks are welded on the respective left and right sides of the mounting plate face to accommodate lifting cables. The casting has two lugs extending rearward on the left and right sides which are bored transversely to receive the trunnion pins. These pins are pressed into place and provide an axis for the rotor and therefore support the entire weight of the gun and rotor assembly.

18. ROTOR ASSEMBLY (fig. 23).

a. The rotor assembly is a heavy steel casting having a longitudinal opening at the center to accept the gun tube and two other openings to accommodate the recoil cylinders. An oil retainer with a knife edge wiping surface is positioned against a shoulder of the central longitudinal opening in the rotor to wipe dust and other foreign matter from the gun tube bearing surface and thus prevent contamination of the lubricant. A hole bored in each end of the rotor and fitted with a bronze bushing receives the trunnion pins upon which the gun pivots in elevation. The cradle is attached to the rear face of the rotor by means of cap screws. The gun shield is secured to the front face of the rotor. The rotor assembly also supports the elevating rack and the direct sighting telescope. The rotor, therefore, carries the weight of the gun together with all the moving parts of the mount.

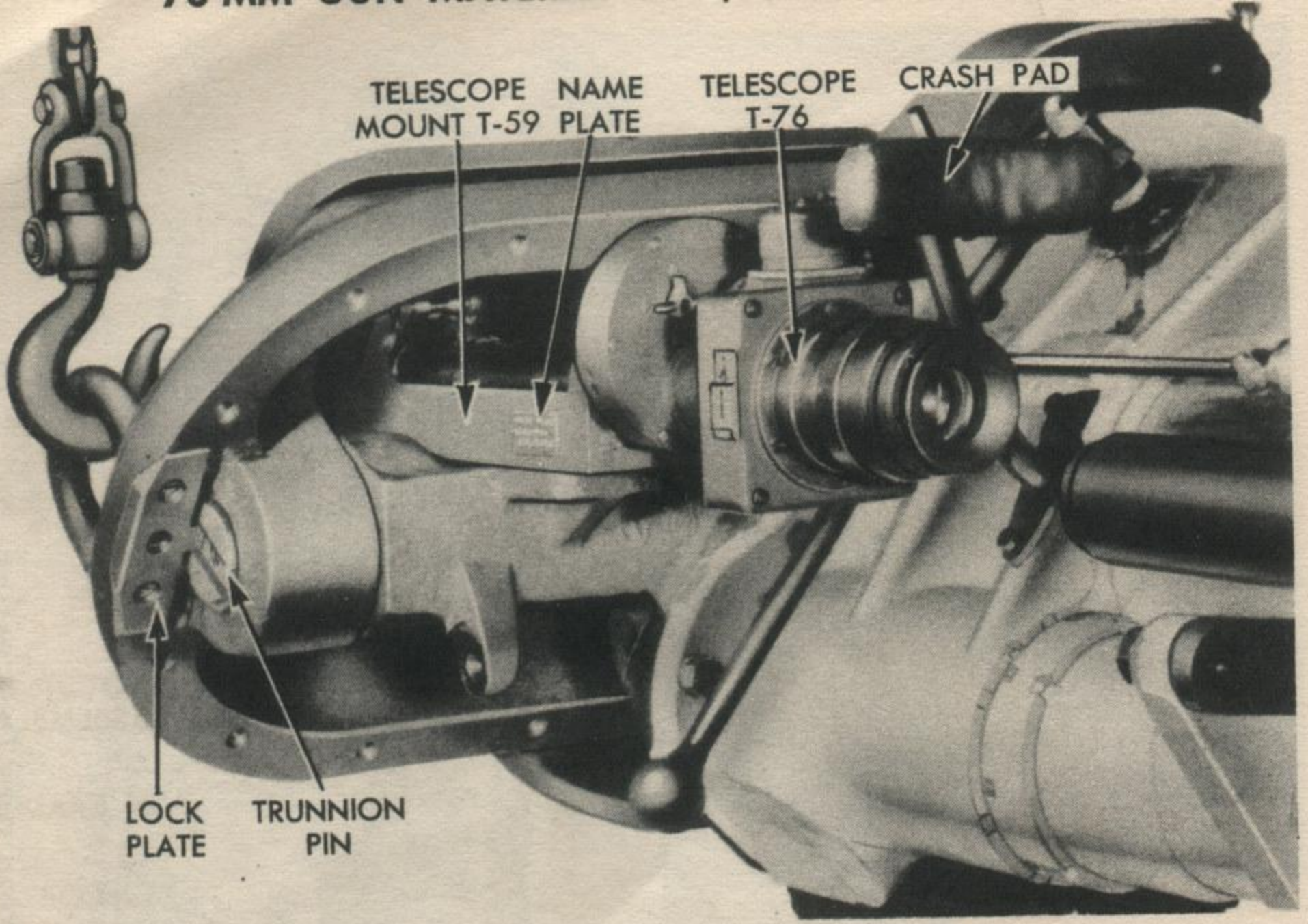

Figure 22 — Telescope Installed

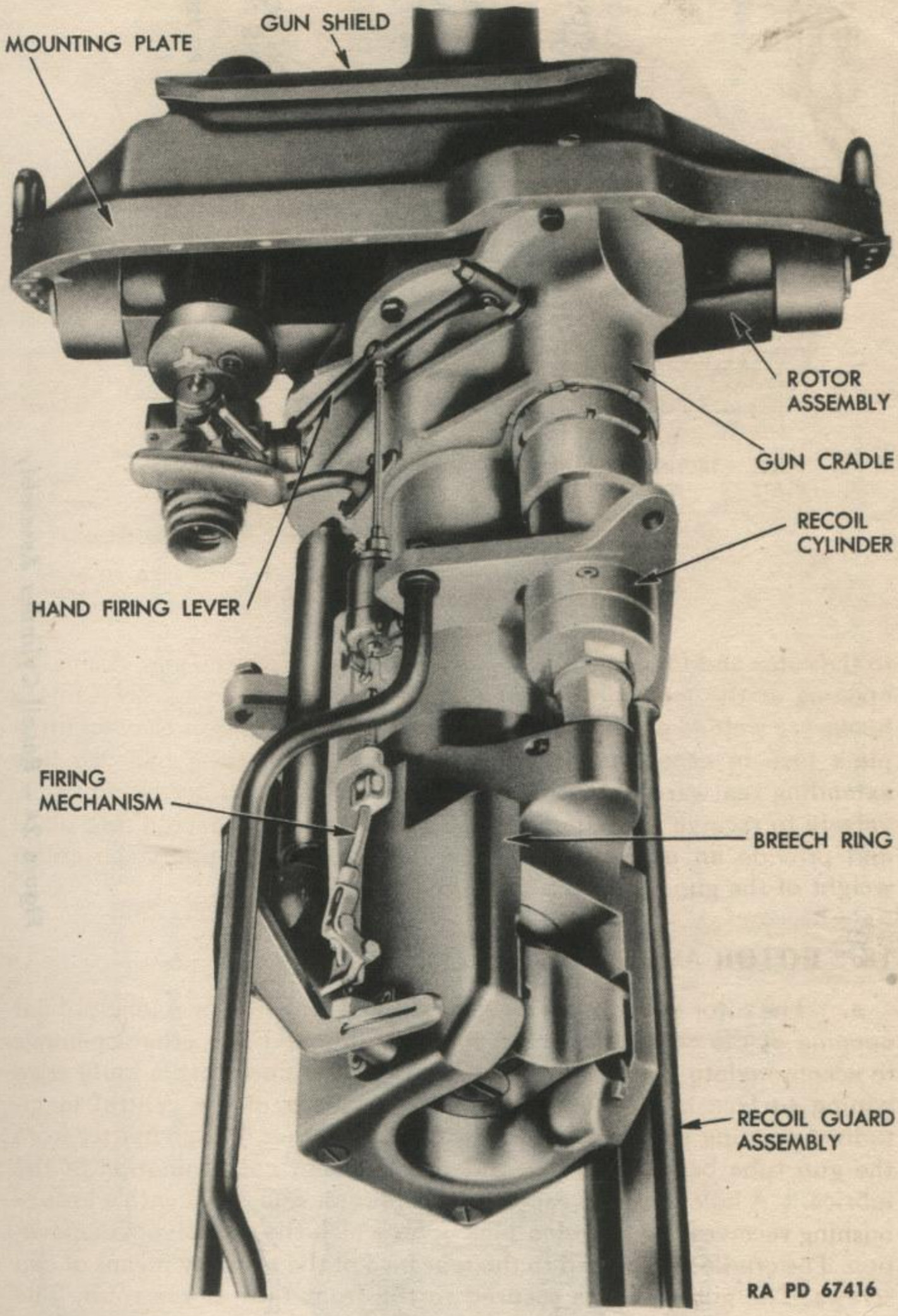

Figure 23 — 76-mm Gun M1 and Mount T1

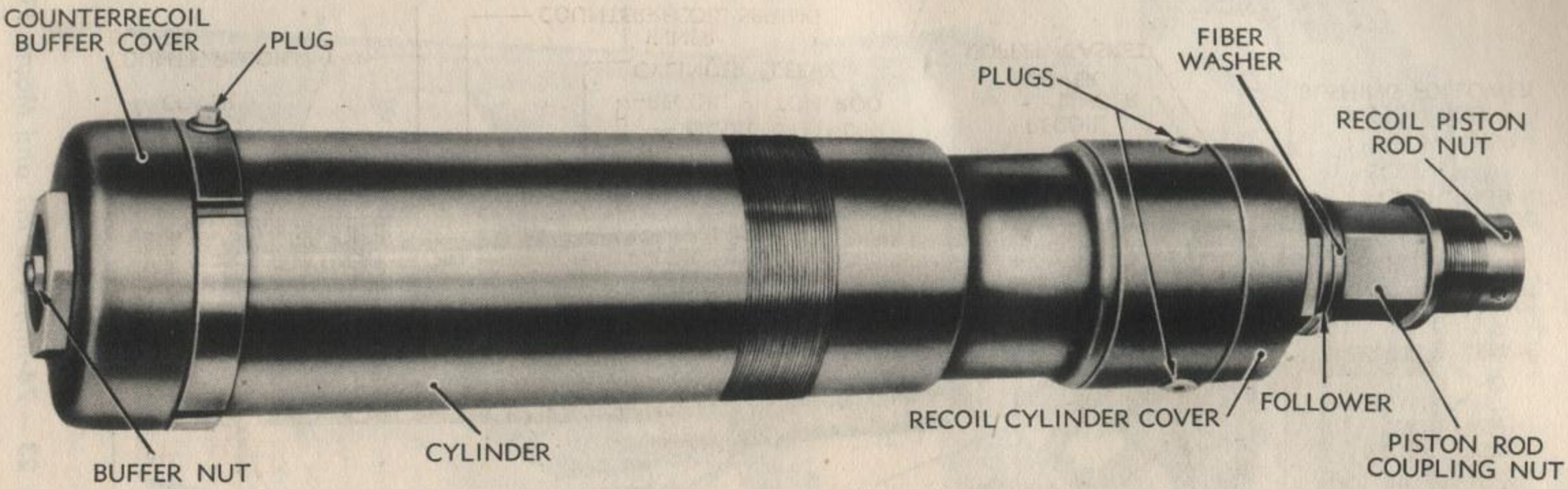

Figure 24 — Recoil Cylinder Assembly

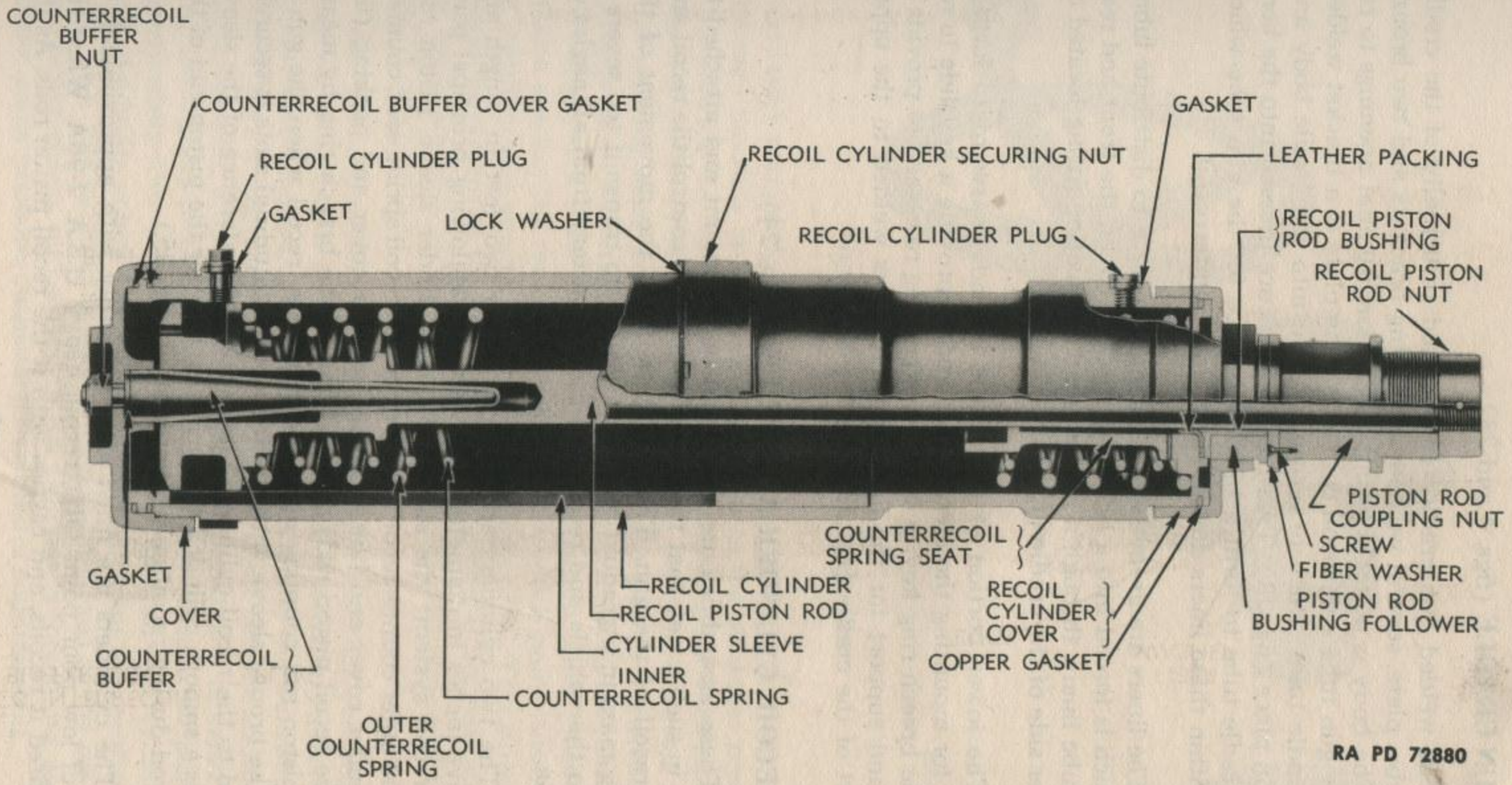

Figure 25 — Recoil Cylinder, Cross Section

19. GUN CRADLE (figs. 4 and 23).

a. The welded gun cradle is composed principally of the cradle body, tube, plate, several welded supporting brackets and two bronze liners. The body is a steel casting having longitudinal openings to receive the gun tube and recoil cylinders. The plate is a bracket welded to the cradle tube, which in turn is pressed into the cradle body and welded in place (fig. 23). Two bronze liners are pressed into the bore of the cradle tube to form a bearing surface for the gun tube which slides within these liners during recoil and counterrecoil.

b. The liners are grooved at their inner surface to distribute lubricant which is forced into a reservoir space between the front and rear cradle tube liners, through a button head lubrication fitting located at the lower side of the cradle (fig. 4).

c. The lower portion of the cradle extends rearward to form a bracket for mounting the ejector cam and to provide a keyslide to receive the breech ring key. A bracket extending rearward to provide a mount and support for the firing mechanism is welded to the upper rear part of the cradle (fig. 23).

20. RECOIL CYLINDER ASSEMBLIES (fig. 24).

a. These assemblies are supported in the mount and attached to the gun in such a way that they work in pairs to control the recoil and counterrecoil of the gun. The cylinders check the movement of the recoiling mass in a gradual manner so as not to transmit too severe a shock to the vehicle and return the gun to battery from all angles of elevation.

b. The two cylinders are approximately two feet in length and about five inches in diameter and house the following principal parts of the recoil system: the slotted bronze cylinder sleeve, piston rod, inner and outer counterrecoil springs, counterrecoil spring seat, counterrecoil buffer cover and buffer, recoil cylinder cover and packing (fig. 25). The recoil piston rods are attached to the breech ring by means of the piston rod coupling nuts, and therefore, recoil when the gun is fired. The bronze sleeve with the tapered longitudinal slots is securely fastened to the recoil cylinder. The inside circumference of the sleeve provides a smooth cylindrical bearing surface for the piston end of the piston rod during recoil and counterrecoil (fig. 25).

c. The cylinders are filled after assembly with approximately 4 quarts of low pour point OIL, recoil, heavy U.S.A. 2-96A. When the gun is fired it recoils, and carries with it the recoil piston rods. As the

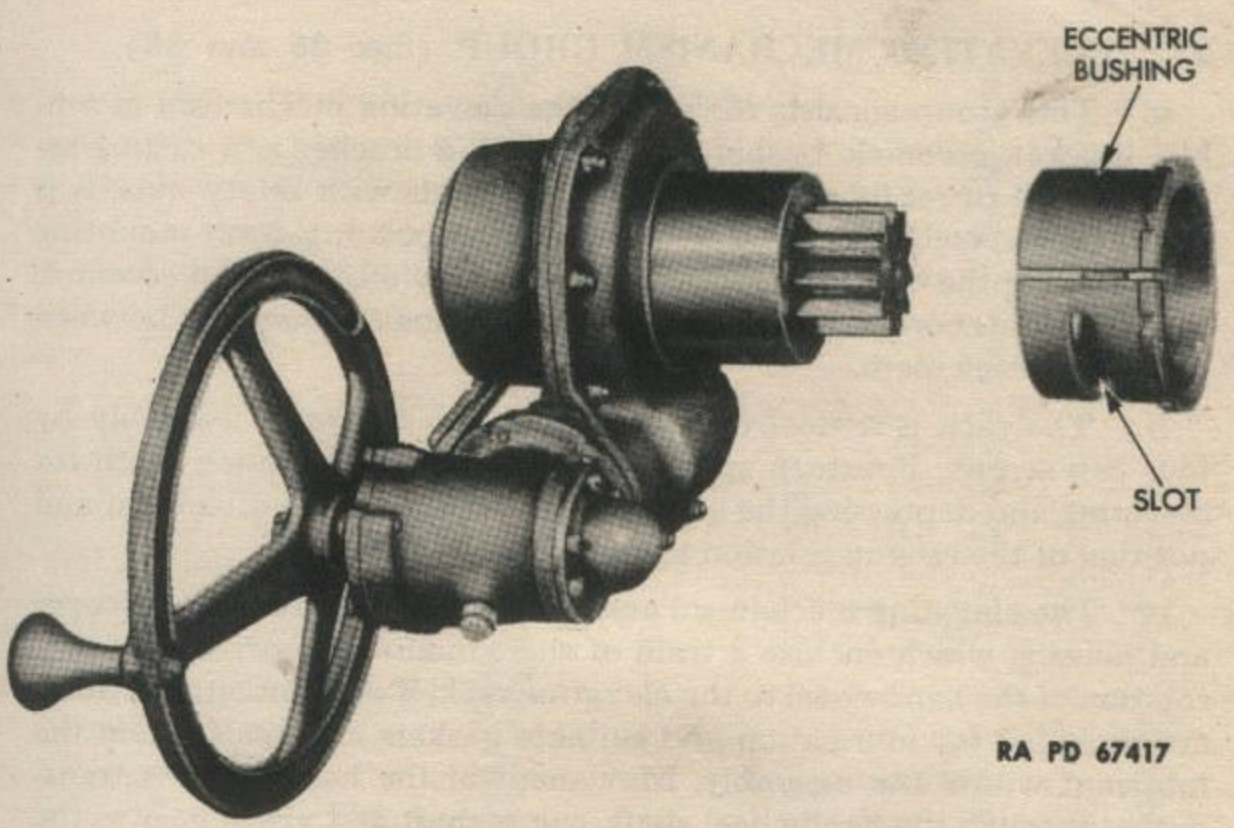

Figure 26 — Elevating Mechanism

rods start rearward, oil on the rear side of the piston end is forced through the slots in the sleeve. This places the oil under pressure and thus restricts the rearward movement of the gun. The slots taper toward the rear of the cylinder and as the recoil piston rod travels rearward, the tapering slots provide an increasingly greater restriction to the passage of oil which gradually retards the rearward movement of the recoiling parts. This gradually retarding action takes place until the piston reaches the rear end of the slots at which point it is brought to a complete stop against an almost solid bank of oil. This stops the rearward movement of the gun and marks the end of normal recoil which is approximately 11⅝ inches out of battery position. The maximum recoil is 14 inches.

d. The counterrecoil springs which were further compressed during recoil react now to force the gun back into battery (fig. 25). This counterrecoil movement is likewise controlled by the slots in the sleeve which have a slight taper at the extreme front end. In addition to the slots, however, a buffer is employed on counterrecoil to assist in reducing the motion of the counterrecoiling parts. When the piston is approximately four inches out of battery, a long tapered cylindrical rod called a buffer enters a cylinder in the front end of the recoil piston rod (fig. 25). The cylinder is filled with oil and closed at the rear end. As the buffer enters, oil trapped in the cylinder is forced out around the buffer under pressure, cushioning the force of counterrecoil.

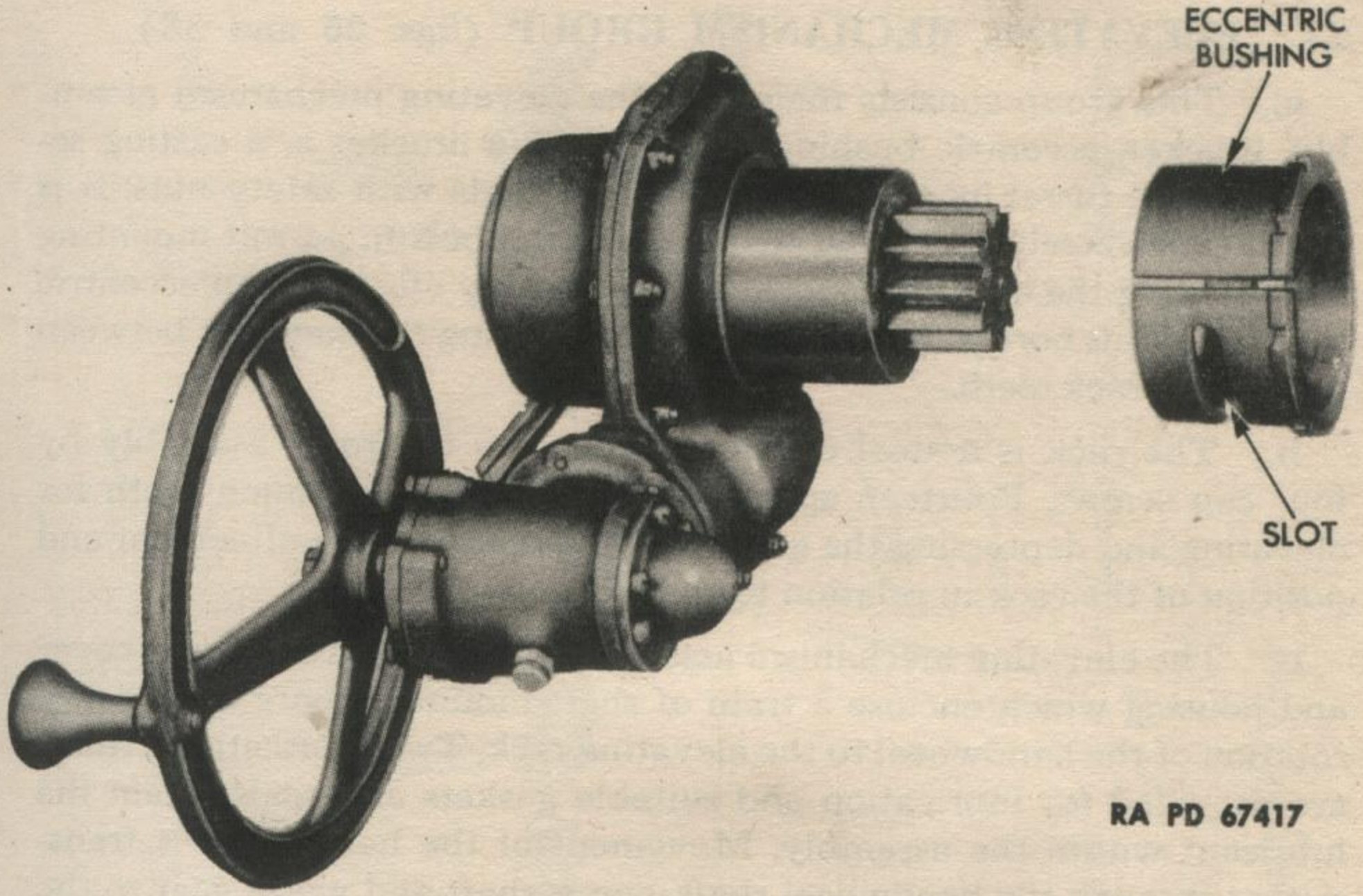

Figure 26 — Elevating Mechanism

21. ELEVATING MECHANISM GROUP (figs. 26 and 38).

a. This group consists mainly of the elevating mechanism assembly, bracket, eccentric bushing and rack. The bracket is a casting secured to the turret by two screws and two studs with safety nuts. It is bored transversely and fitted with a clamping bolt to permit mounting and securing the elevating mechanism assembly (fig. 38). An eccentric bushing in this bore provides a means of adjusting the backlash between pinion and rack teeth.

b. The rack is a steel casting attached to the rotor assembly by four cap screws. Fourteen spur teeth mesh with the pinion teeth for elevating and depressing the gun. A key insures positive alinement and position of the rack in relation to the rotor.

c. The elevating mechanism assembly is composed of a base, cover and housing which enclose a train of shaft mounted gears to transmit rotation of the handwheel to the elevating rack. Two lubrication fittings are provided for lubrication and suitable gaskets and seals retain the lubricant within the assembly. Movement of the handwheel is transmitted through the handwheel shaft, worm shaft and worm gear to the worm wheel, spur gear, internal gear and pinion shaft (fig. 26). One revolution of the handwheel elevates the gun 13.037 mils.

22. FIRING MECHANISM GROUP (fig. 27).

a. Included in this group is a solenoid, firing shaft, rod, lever, return spring and firing shaft release lever with shaft (fig. 27). The solenoid is mounted above the gun and is attached to the cradle tube plate by three cap screws (figs. 2 and 45). The firing shaft is notched on the right-hand side to engage the release lever shaft. The rear end is drilled to receive a pin for connecting it to the firing lever rod. This rod is formed into a yoke at one end and is threaded at the other for installation of the rod end yoke. The firing lever (fig. 27) is connected to this rod end yoke and pivoted on a bolt in such a manner, that when rotated it contacts the firing plunger in the breech ring.

b. When the firing pedal (fig. 42) on the gunner's platform is depressed, an electric current is sent through the solenoid. The solenoid plunger pushes against the front end of the firing shaft which operates the firing lever through the firing lever rod. The firing lever operates the firing plunger in the breech ring which releases the sear in the breechblock to fire the round. The solenoid plunger may also be actuated manually by pulling rearward on the hand firing lever pivoted at the upper side of the cradle. Rearward movement of this lever is transmitted to the solenoid plunger through a swivel and rod (fig. 59). The firing mechanism is returned to its initial position by a return spring mounted over the firing shaft.

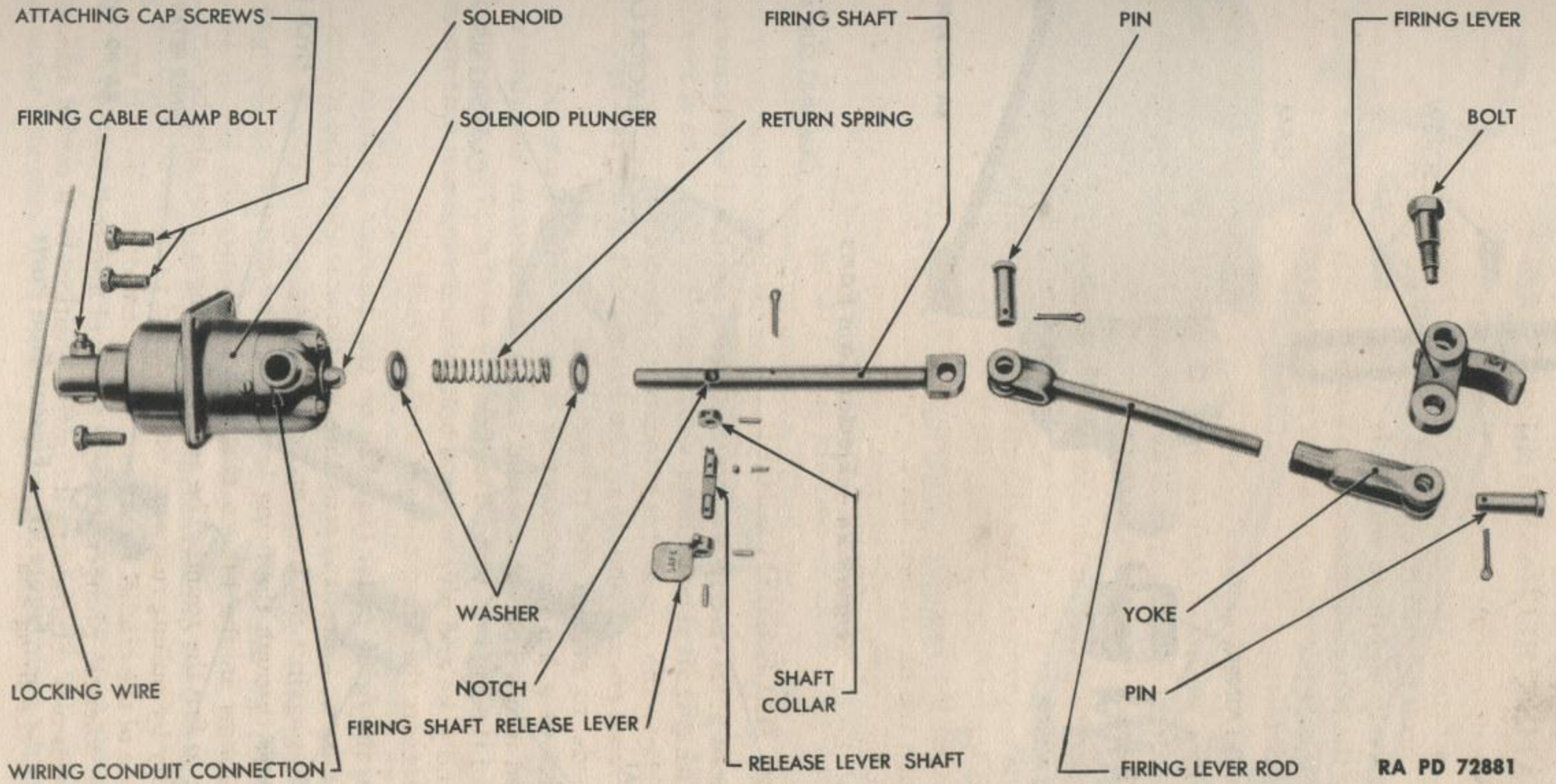

Figure 27 — Firing Mechanism, Exploded View

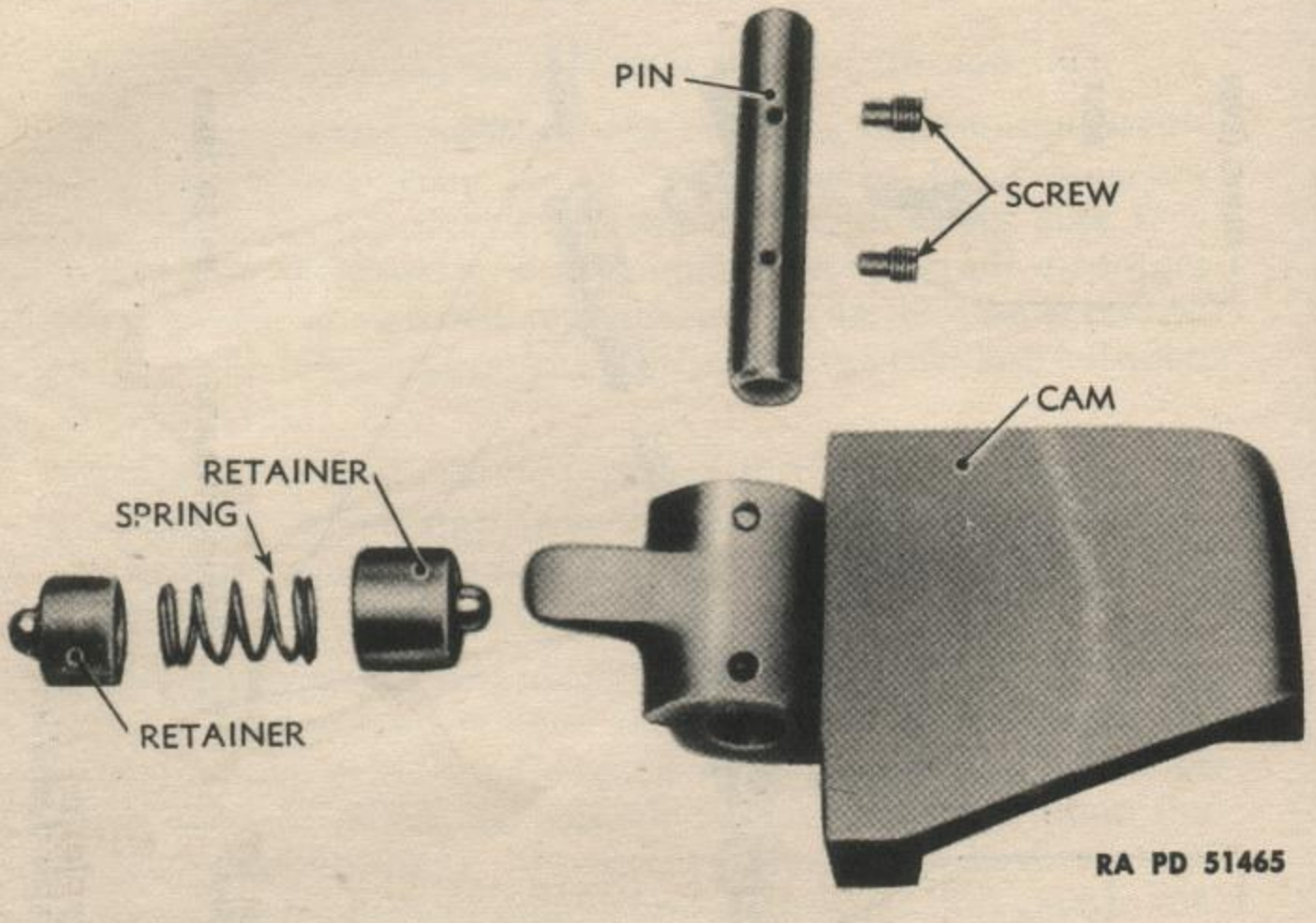

Figure 28 — Ejector Cam Parts

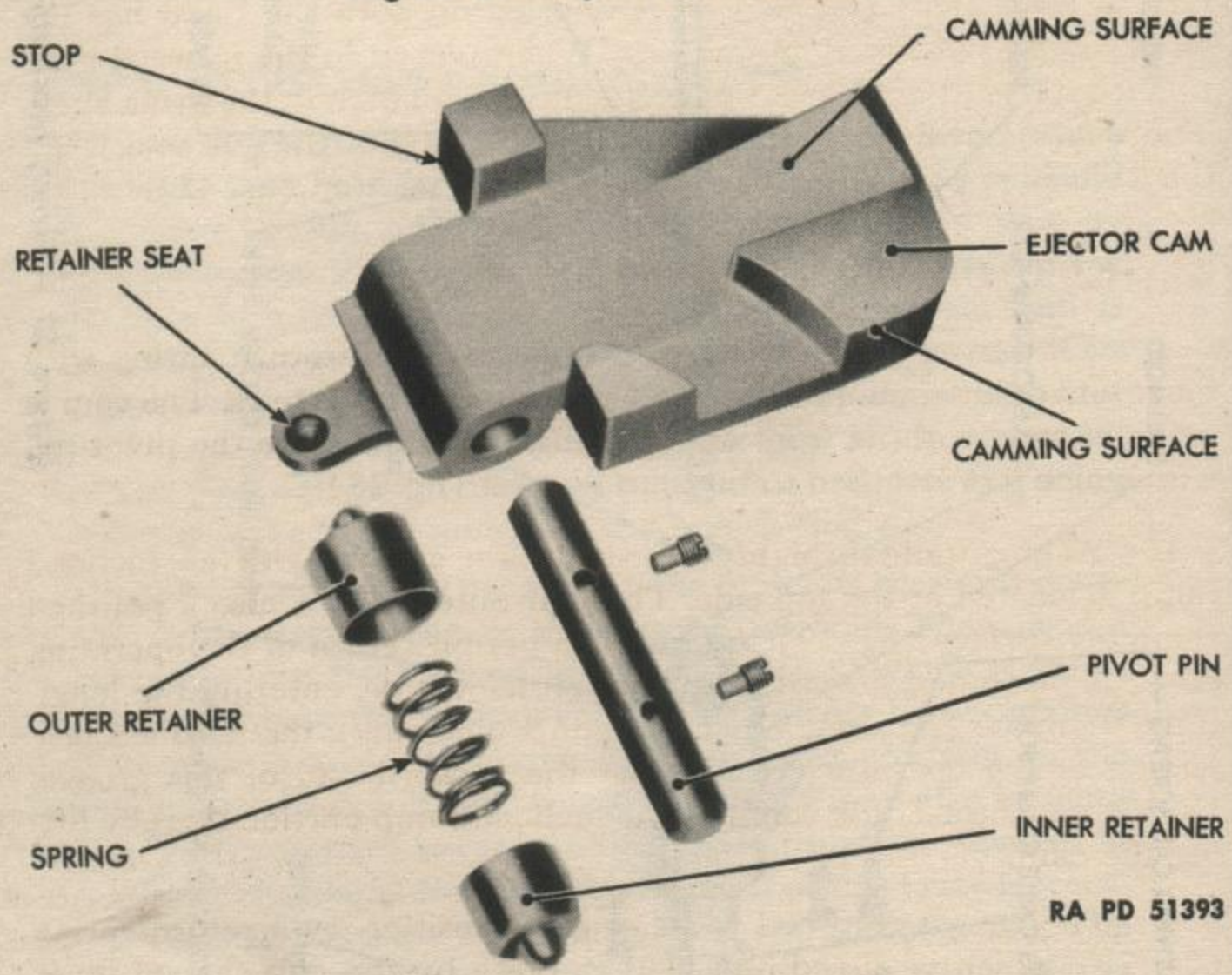

Figure 29 — Ejector Cam Parts

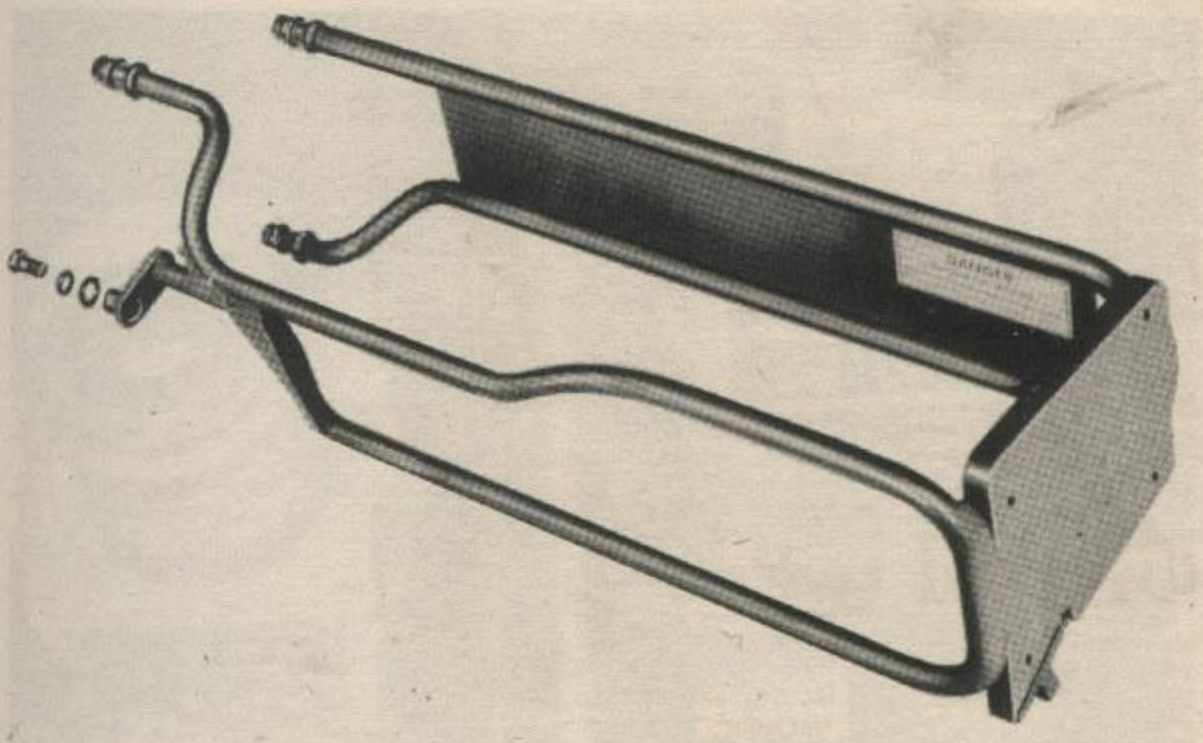

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Figure 30 — Recoil Guard Assembly

c. The firing shaft release lever is pinned to the upper end of the release lever shaft (fig. 27). It is knurled on both sides and has the word "SAFE" stamped on one side. When placed in the forward position it rotates its shaft into engagement with a notch in the firing shaft. The word "SAFE" is visible from the right side of the gun and when the lever is so positioned, the weapon cannot be fired (fig. 45).

23. EJECTOR CAM GROUP (figs. 28 and 29).

a. This group is made up of the ejector cam, return spring with inner and outer retainers, the pivot pin and two set screws. The cam is made of steel with its front end drilled to accommodate the pivot pin with which it is attached to the cam bracket (fig. 28).

b. A longitudinal, highly polished cam groove with an inclined ramp is located at the top side. The rear outer edge is also a polished camming surface (fig. 29). A groove to permit return of the operating crank is machined inward from the left-hand side, entering the longitudinal groove (fig. 29). When the gun is in battery the polished projection of the operating crank is at the forward end of this groove. During recoil the crank contacts the inclined ramp portion thereby lifting the cam.

c. The cam is returned to its original position by a return spring (fig. 28) which is alined and held in place by the cup shaped inner and outer retainers. This return movement takes place when the gun

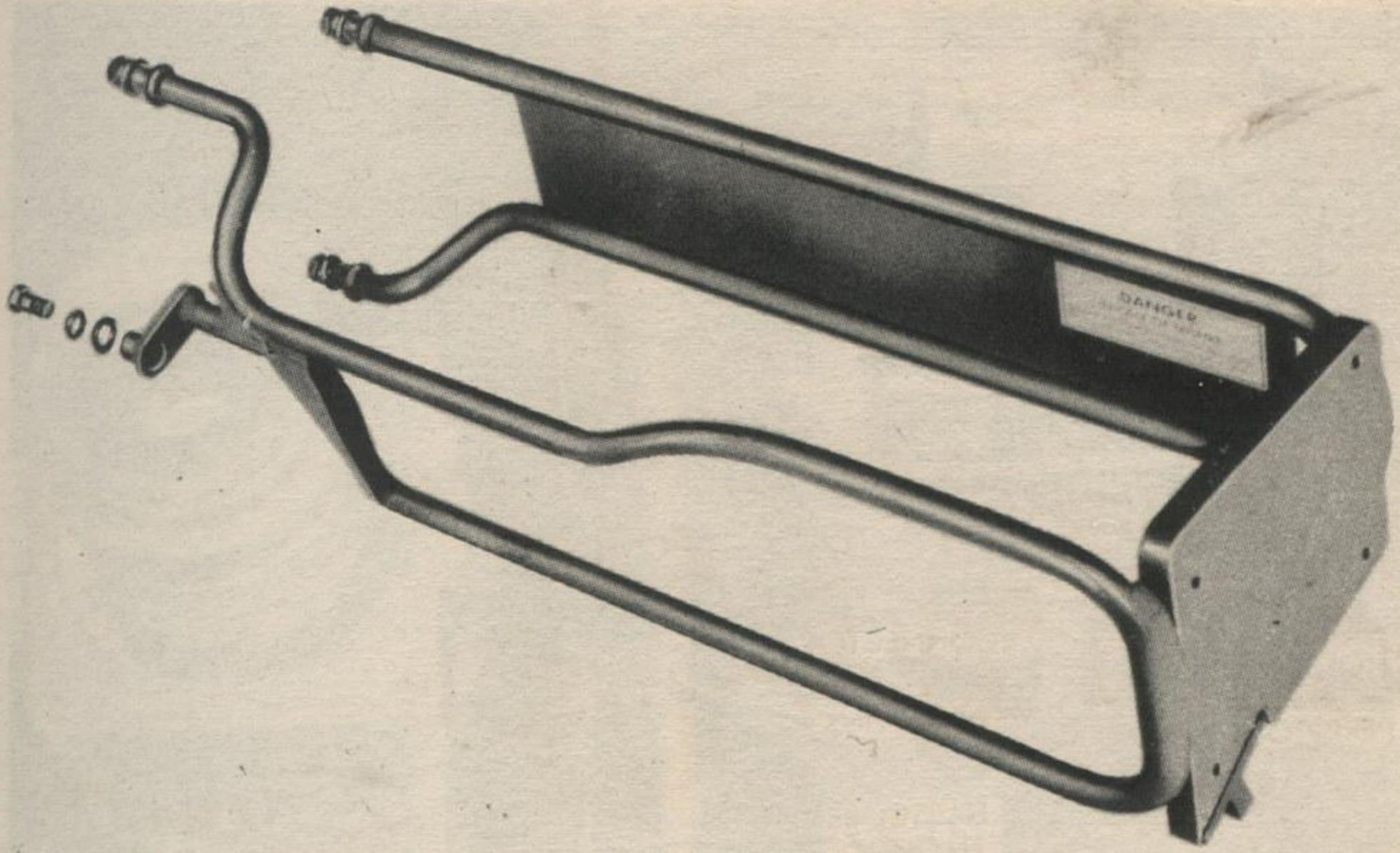

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Figure 30 — Recoil Guard Assembly

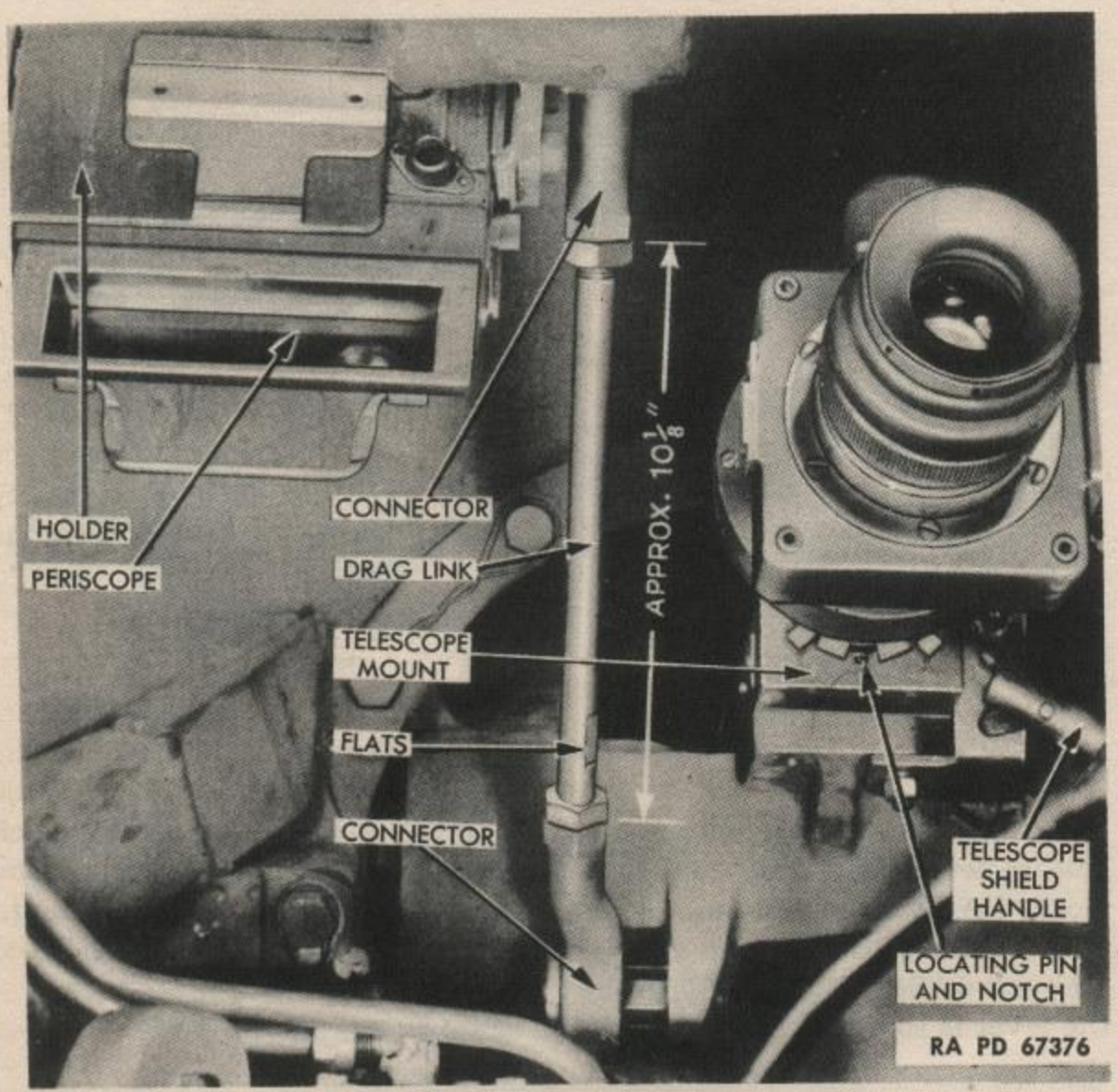

Figure 31 — Periscope and Drag Link Installed in Turret

has carried the operating crank rearward past the ejector cam during the recoil stroke.

d. During counterrecoil, the operating crank contacts the outer rear edge and as the gun continues forward toward battery the operating crank and spline shaft are rotated, thus opening the breech and ejecting the empty cartridge case. Further movement of the gun into final battery position rotates the operating crank in a counterclockwise direction until it has cleared the ejector cam and come to rest in alinement with the return groove.

e. When the extractors (fig. 12) are tripped forward, as when loading a round into the chamber, the closing spring rotates the operating crank in the other direction. The projection on the crank passes through the ejector cam return groove thus allowing the crank to take its battery position ready for another cycle.

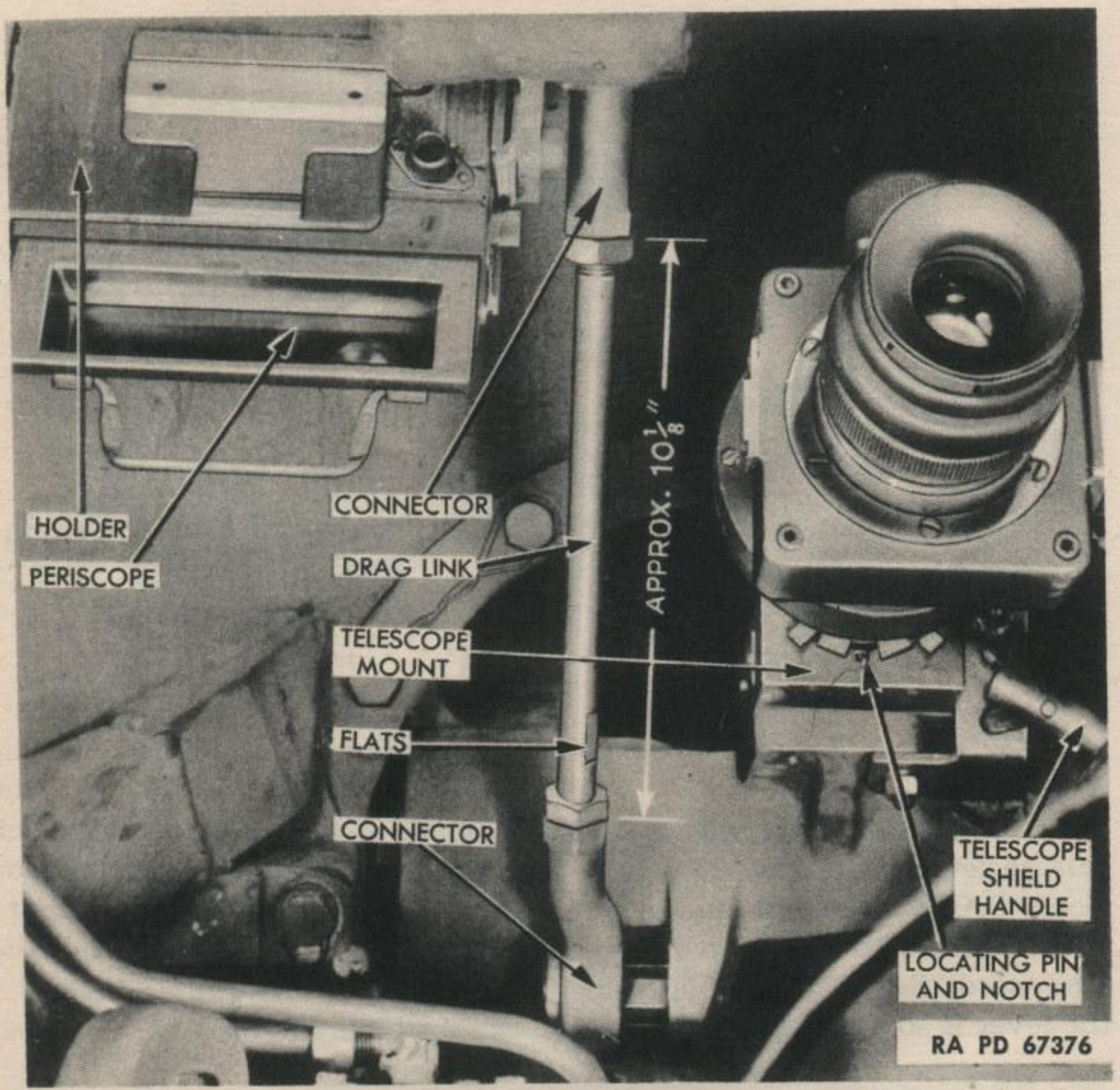

Figure 31 — Periscope and Drag Link Installed in Turret

DESCRIPTION AND FUNCTIONING OF THE 76-MM GUN MOUNT T1

24. RECOIL GUARD ASSEMBLY (fig. 30).

a. This guard is attached to the cradle bracket to afford protection for the occupants of the turret (fig. 2). The guard is composed of two U-shaped frame members of round steel rod, a heavy steel end plate, two sheet metal sections together with attaching screws, nuts and lock washers. The right frame member is covered with a sheet metal section (fig. 30). The top, left and bottom sides are open. The end plate is a heavy steel member which serves to balance the gun and cradle assembly and is welded to the rear, closed end portions of the frame members. The guard is approximately 15 inches wide and extends 22 inches beyond the rear of the gun breech to give clearance for recoil of the gun. The ends of the frame members are drilled, threaded and shouldered for attachment to the cradle bracket by four screws and washers.

25. PERISCOPE DRAG LINK GROUP (fig. 31).

a. The sighting periscope drag link consists principally of a rod, bracket, and upper and lower connections with bearings and assembling parts. The function of this group is to synchronize the gun with the sighting periscope. The lower connection is assembled on a stud which is threaded into a lug on the left side of the rotor. The upper connection and bracket are assembled on another stud, the bracket connecting to the periscope holder. The connectors are screwed onto the ends of the drag link rod and secured by jam nuts (fig. 31).

Section IV

DESCRIPTION AND FUNCTIONING OF THE CAL. .50 A.A. GUN AND MOUNT

	Paragraph
General	26
Cooling	27
Recoil mechanism	28
Sights	29
Mount	30

26. GENERAL.

a. The Browning Machine Gun, cal. .50, H.B., M2, is a recoil-operated, belt-fed, air-cooled weapon (fig. 32).

27. COOLING.

a. To retard overheating, the gun is provided with a heavy barrel. The slots in the barrel support permit circulation of air around the breech end of the barrel. Long continuous bursts of automatic fire should not be used as excessive wear of the barrel is encountered and there is danger of premature firing due to overheating of the chamber. Normally, the gun is fired in short bursts, and this type of fire can be continued for an appreciable length of time. With a cool gun, a single burst of 100 to 150 rounds can be fired. Firing about 40 rounds a minute will permit intermittent firing of approximately 500 rounds without overheating. As tactical conditions permit, hot barrels should be changed.

28. RECOIL MECHANISM.

a. Recoil is absorbed by the weight of the recoiling parts, oil buffer spring, and the driving spring. Guns of early manufacture had recoil oil in the oil buffer assembly. Recently, it has been found that the gun functions more satisfactorily without recoil oil. Guns of new manufacture will not have oil in the oil buffer assembly.

29. SIGHTS

a. Conventional sights are provided on the gun.

30. MOUNT.

a. The A.A. mount consists principally of two inner free moving rings, an outer bearing ring, gun support, gun cradle, and attaching parts (fig. 32).

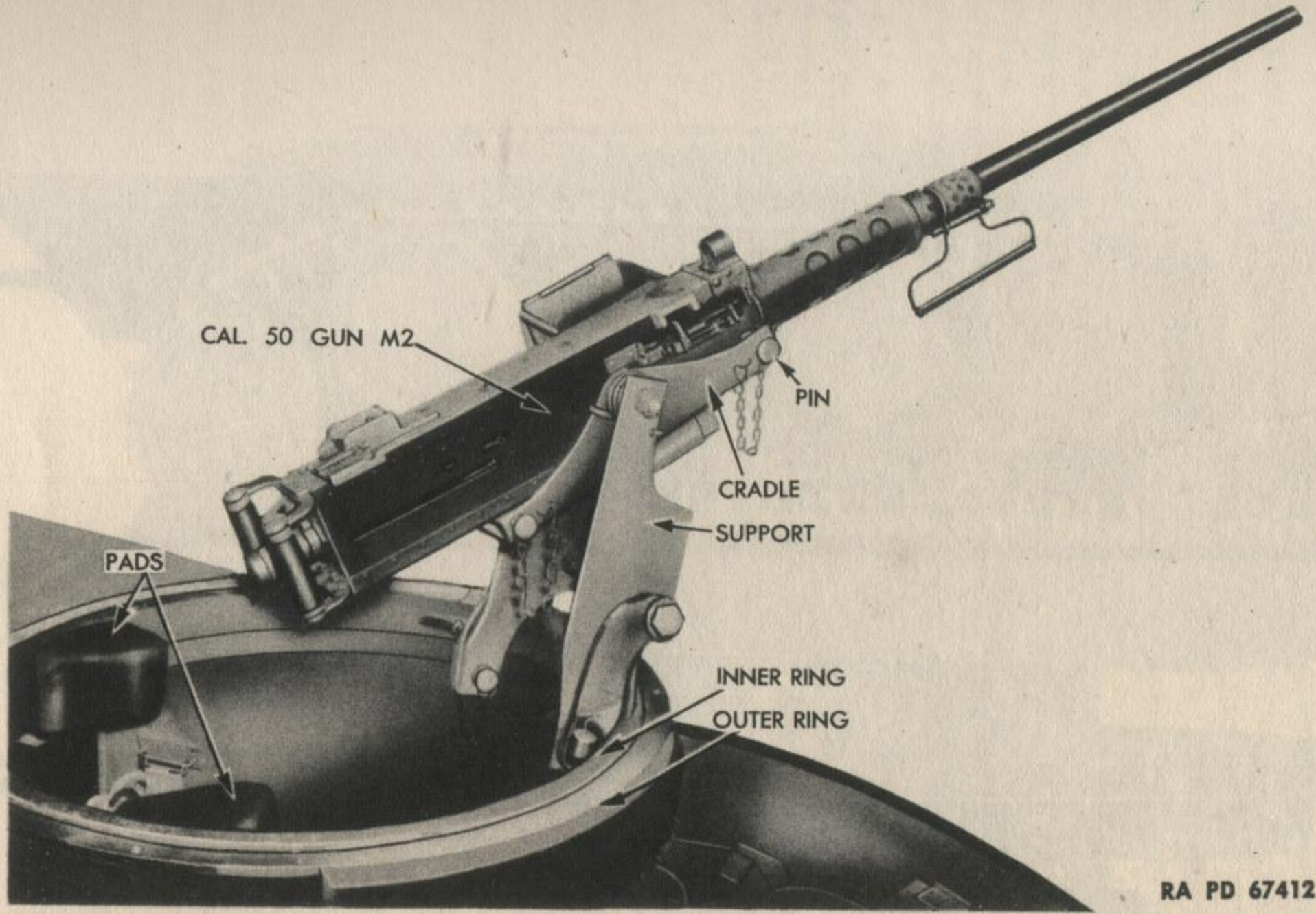

Figure 32 — Browning Machine Gun, Cal. .50, HB, M2

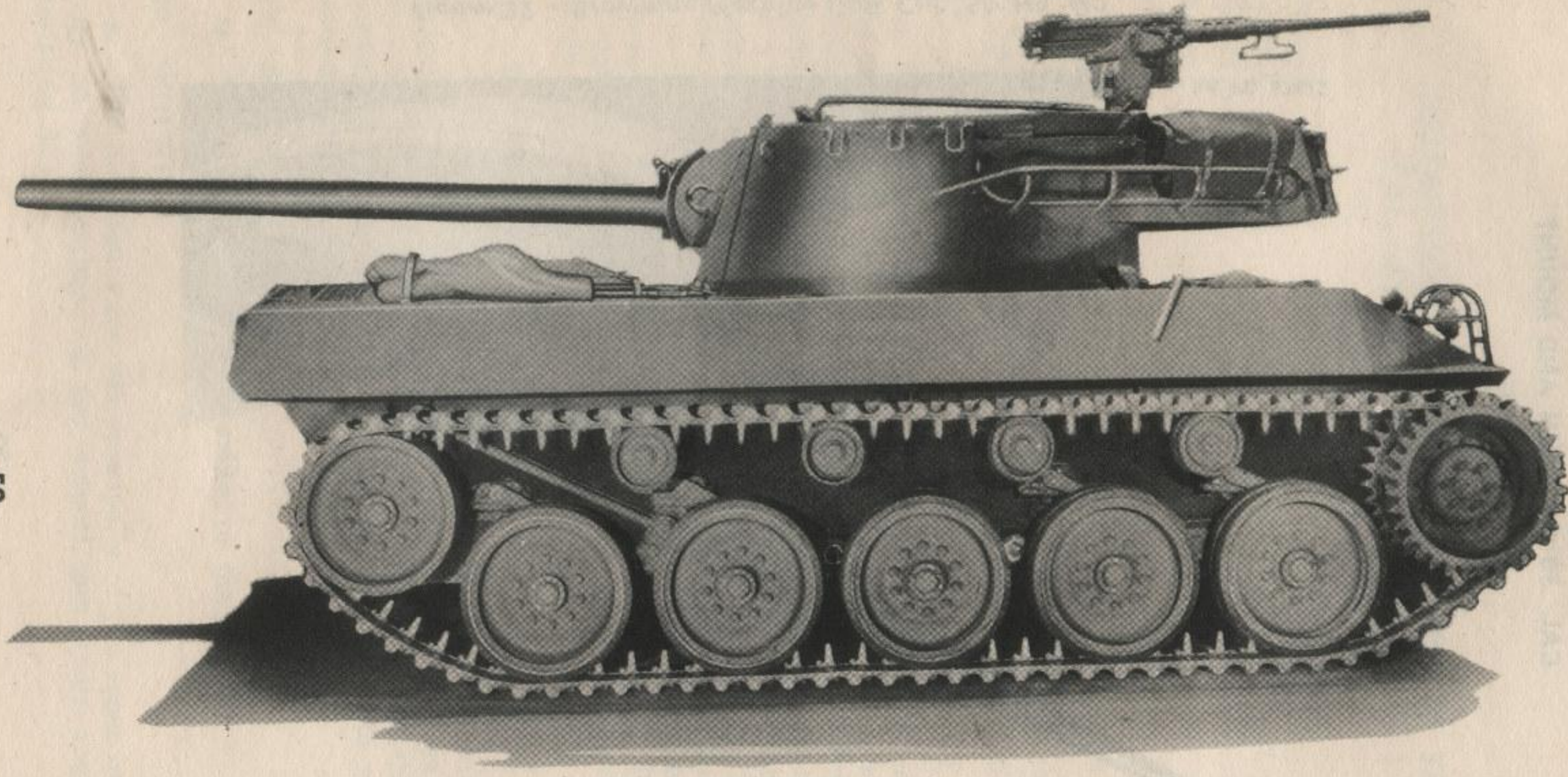

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Figure 33 — Stowage of Tripod Mount M3 — 76-mm Gun Motor Carriage T70

DESCRIPTION AND FUNCTIONING OF THE CAL. .50 A.A. GUN AND MOUNT

b. The outer bearing ring is secured to the turret and is stationary with it. A tubular bar which rests on the turret shelf supports the ring. Two inner rings, an upper and a lower held together by cap screws are positioned inside the outer bearing ring. An integral bracket on the upper inner ring attaches to the gun support (fig. 32). The assembled inner rings are supported by ball bearings located between the inner ring assembly and the outer bearing ring. Shoulder pads are provided for the gunner and are attached to the inner ring (fig. 32). The gun may be traversed, independently of the turret, a full 360 degrees. The gun support holds the gun cradle which pivots axially on two attaching bolts. A tension coil spring between the gun support and the cradle acts as a medium for keeping the gun in balance. The gun is attached to the cradle by two pins while an ammunition box is attached to the left side of the gun cradle. A pin latch locks the cradle to the gun support in the traveling position. The traversing inner rings can be locked by a hand-operated brake on the mount ring assembly.

c. A Tripod Mount M3 is carried on the vehicle at the right-hand upper center hull surface (fig. 33). The cal. .50 Gun M2 H.B. may be removed from the A.A. ring mount and used on the ground with this tripod mount when conditions make this advisable.

Section V

OPERATION

	Paragraph
Placing 76-mm gun in firing position	31
Checking oil in recoil cylinders	32
Traversing turret	33
Elevating gun	34
Loading the gun	35
Firing the gun	36
Recocking the gun	37
Unloading the gun	38
Placing gun in traveling position	39
Operation of cal. .50 A.A. machine gun M2 and mount	40

31. PLACING 76-MM GUN IN FIRING POSITION.

a. Remove gun covers and store them out of the way in the proper place assigned for them; likewise store other equipment not required for operating the gun.

b. Remove traveling bar lock pin and place traveling bar in its stowed position (fig. 35).

NOTE: Before disengaging traveling bar from gun cradle make sure elevating mechanism shifter lever is in the engaged or left position (fig. 40).

c. Make pre-firing inspection as covered in section VII to see that gun and mount are in proper condition for firing.

32. CHECKING OIL IN RECOIL CYLINDERS.

a. For proper functioning the recoil cylinders must contain the correct grade and amount of oil. Care must be taken to use prescribed recoil fluid only. Low pour point OIL, recoil, heavy (U. S. A. Specification 2-96A) will be used when the prevailing temperatures are above 0 F. For prevailing temperatures not exceeding +32 F, OIL, recoil, special, will be used if available. If OIL, recoil, special, is not available, a mixture of 75 percent OIL, recoil, heavy, and 25 percent OIL, recoil, light (U. S. A. Specification 2-36D) will be used. For care and handling of recoil oil see paragraph 47.

b. Replenish oil to proper level in recoil cylinders by depressing gun 9 degrees and removing recoil cylinder plugs at the rear end of each cylinder (fig. 25). These plugs must be at the top. Fill the cylinders with oil until level reaches bottom of hole and replace plugs. For proper filling of empty cylinders see paragraph 46 f.

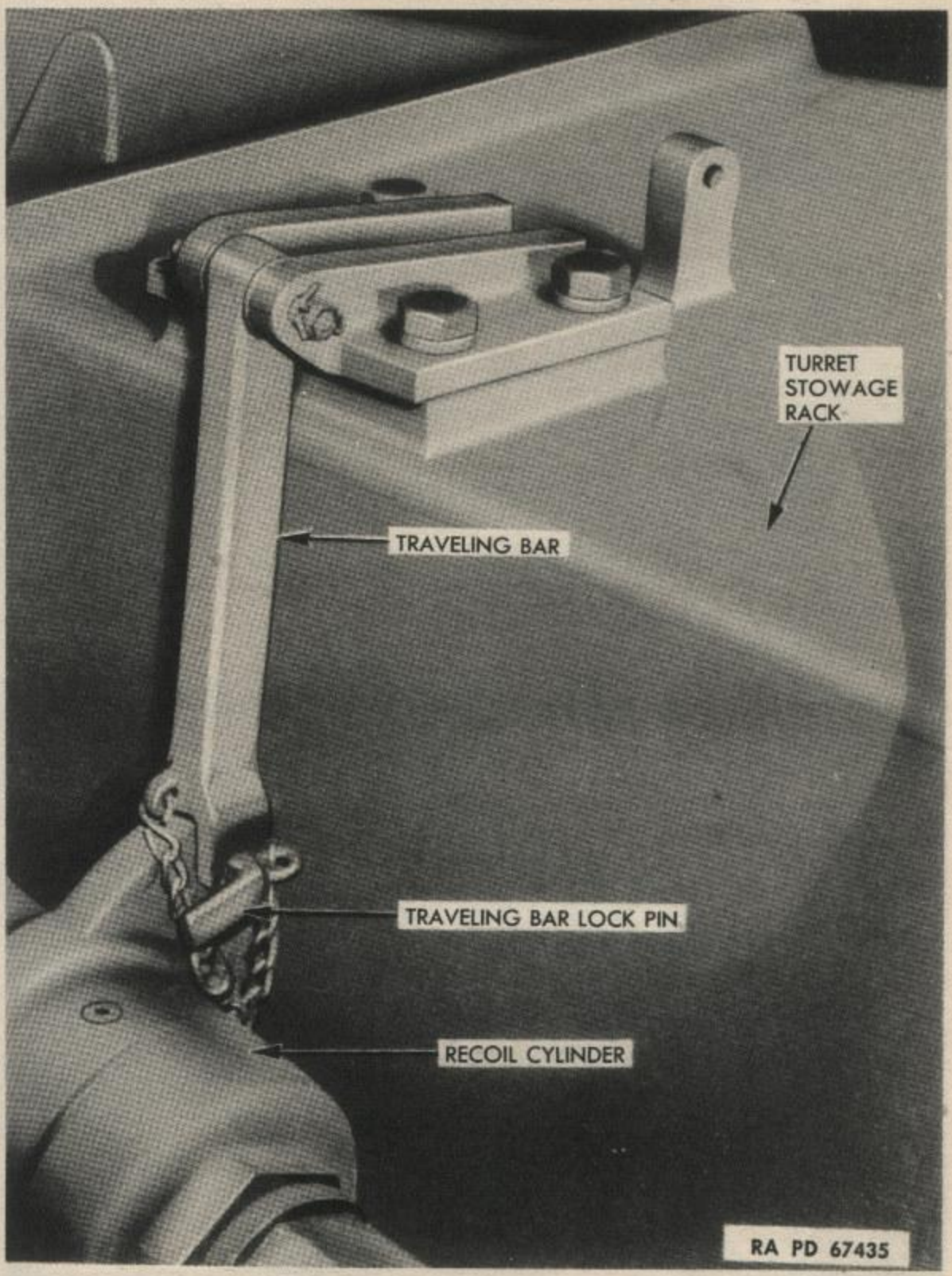


Figure 34 — Traveling Bar Engaged

33. TRAVERSING TURRET.

a. The turret may be traversed manually or hydraulically for the full 360 degrees in either direction.

b. Before traversing turret make sure all hatches are closed and that equipment and personnel are not in a position to be damaged or injured. Also elevate gun sufficiently to clear rear deck equipment.

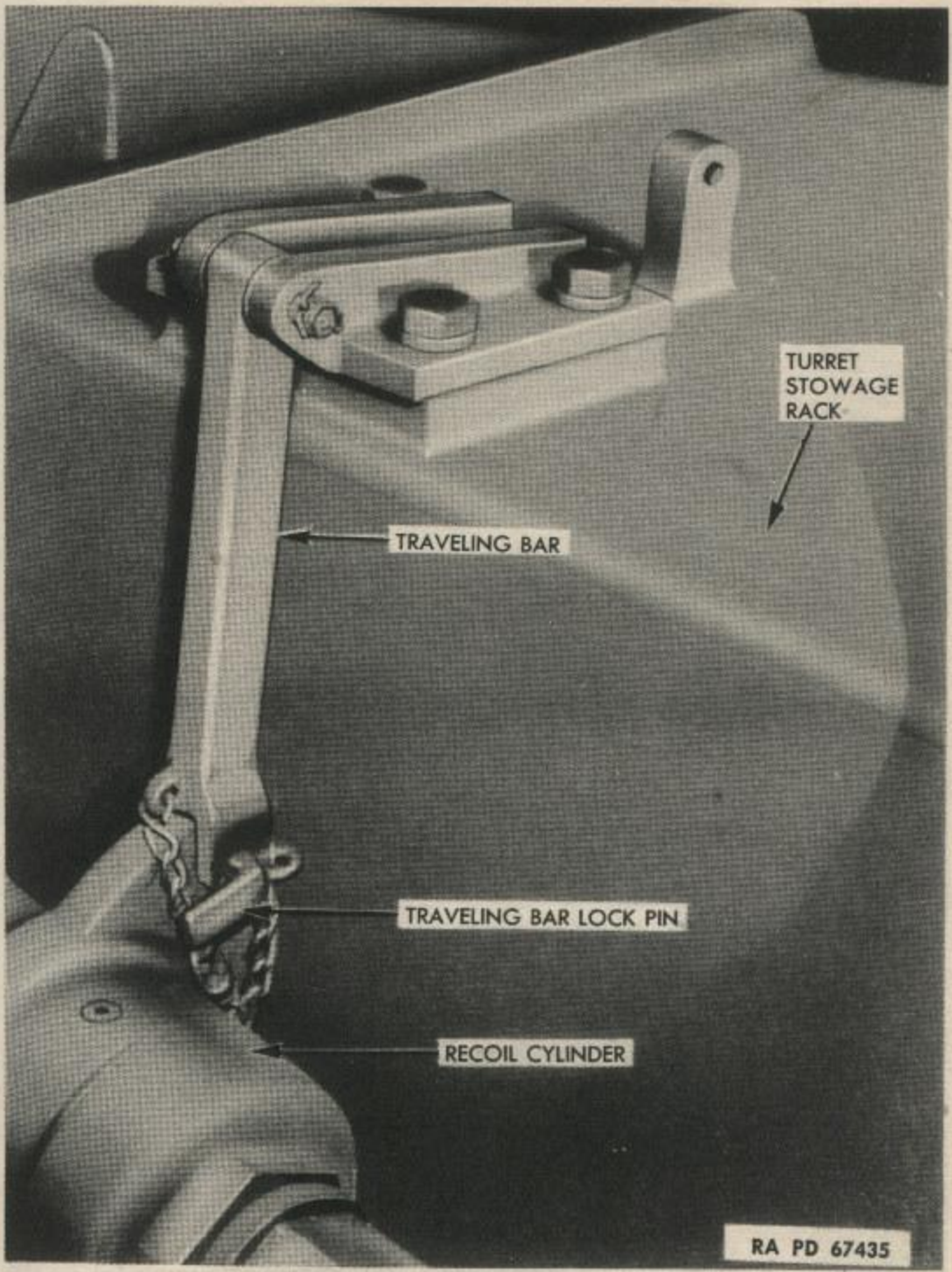


Figure 34 — Traveling Bar Engaged

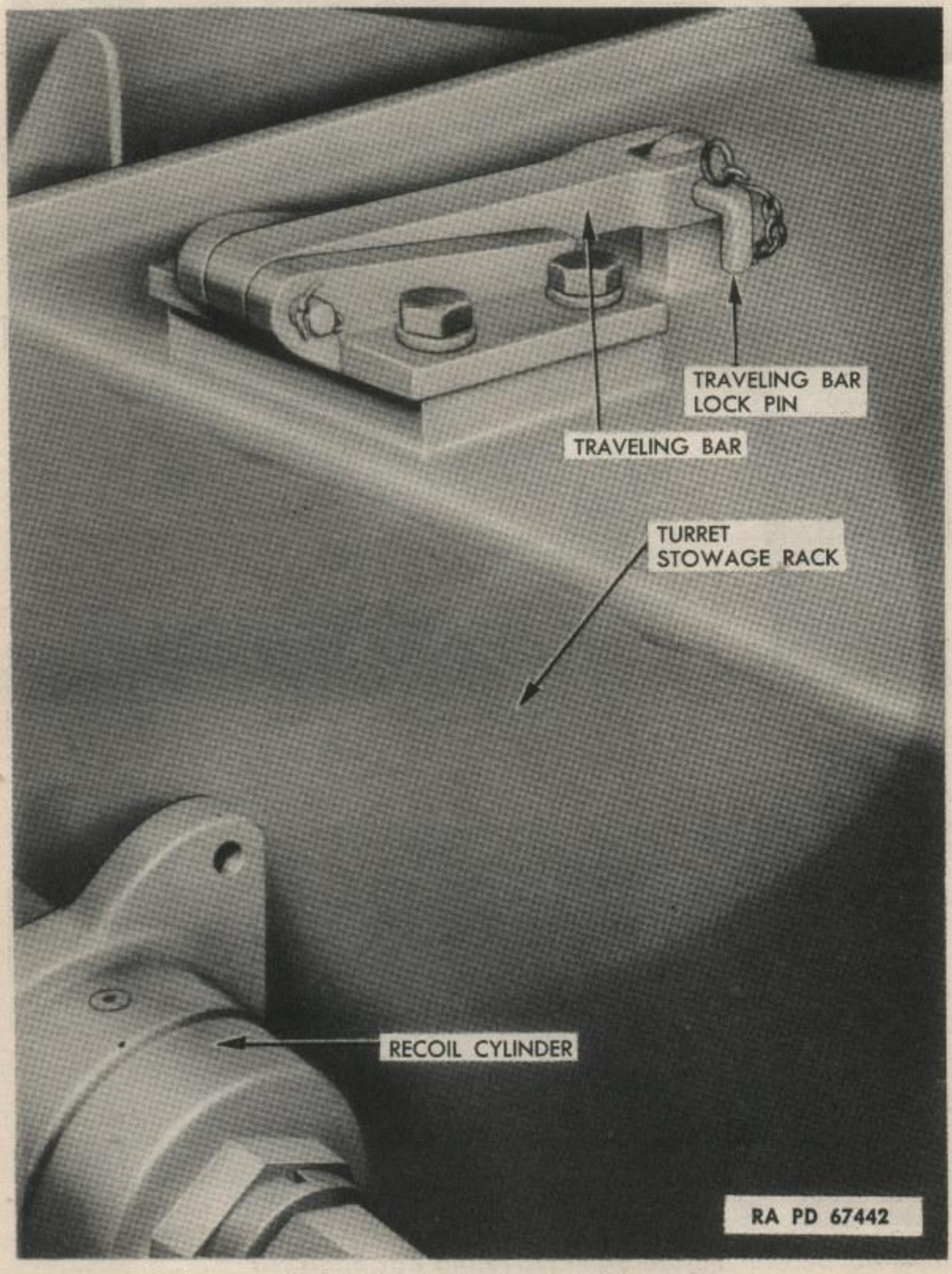


Figure 35 — Traveling Bar in Stowed Position

c. The turret lock must be disengaged from the turret ring gear by turning the lock handle to its forward position which is marked "FREE" (fig. 36). CAUTION: It is very important to have the lock completely disengaged from the ring gear teeth before traversing turret. The turret lock may be engaged by turning the handle

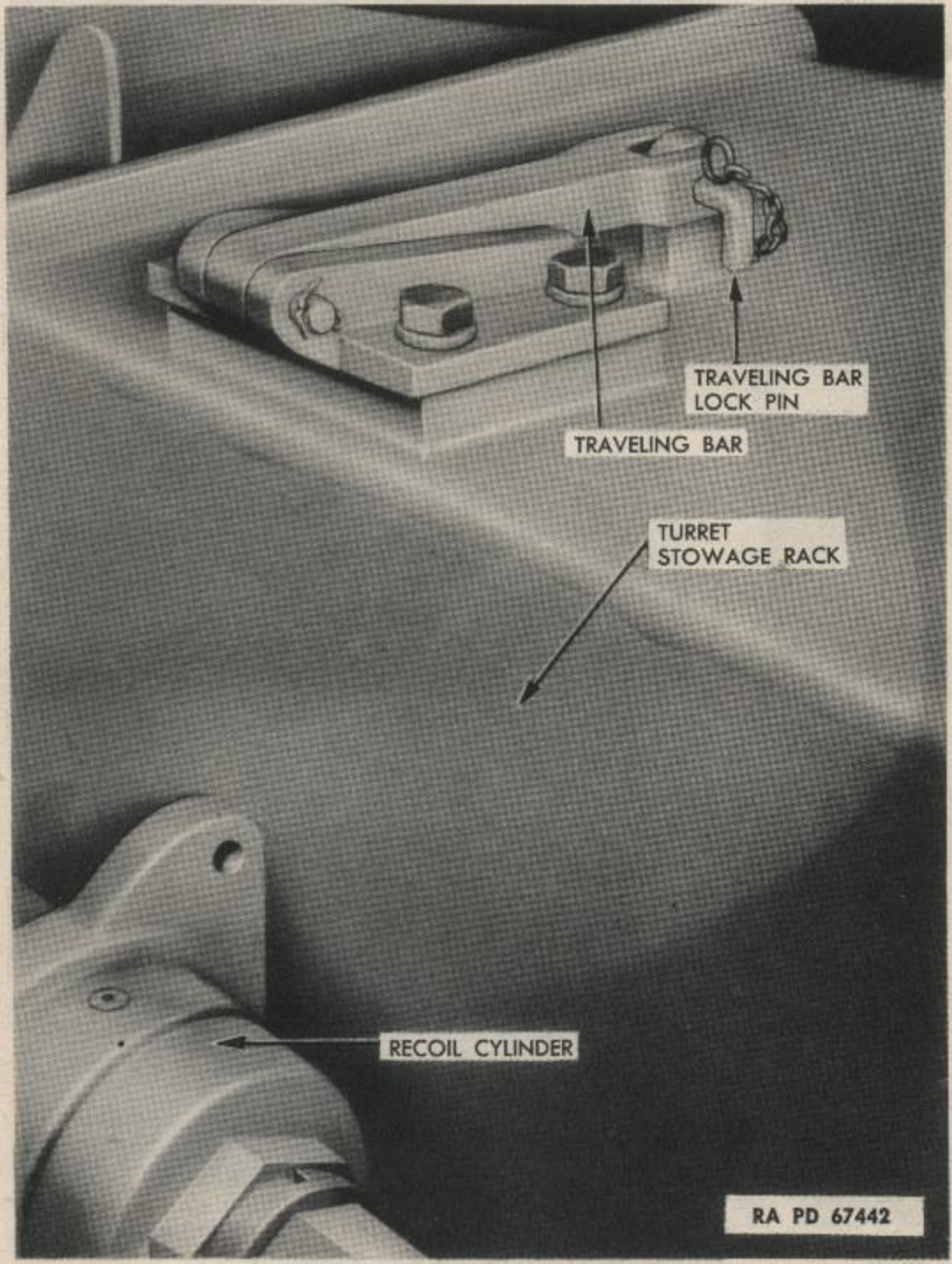


Figure 35 — Traveling Bar in Stowed Position

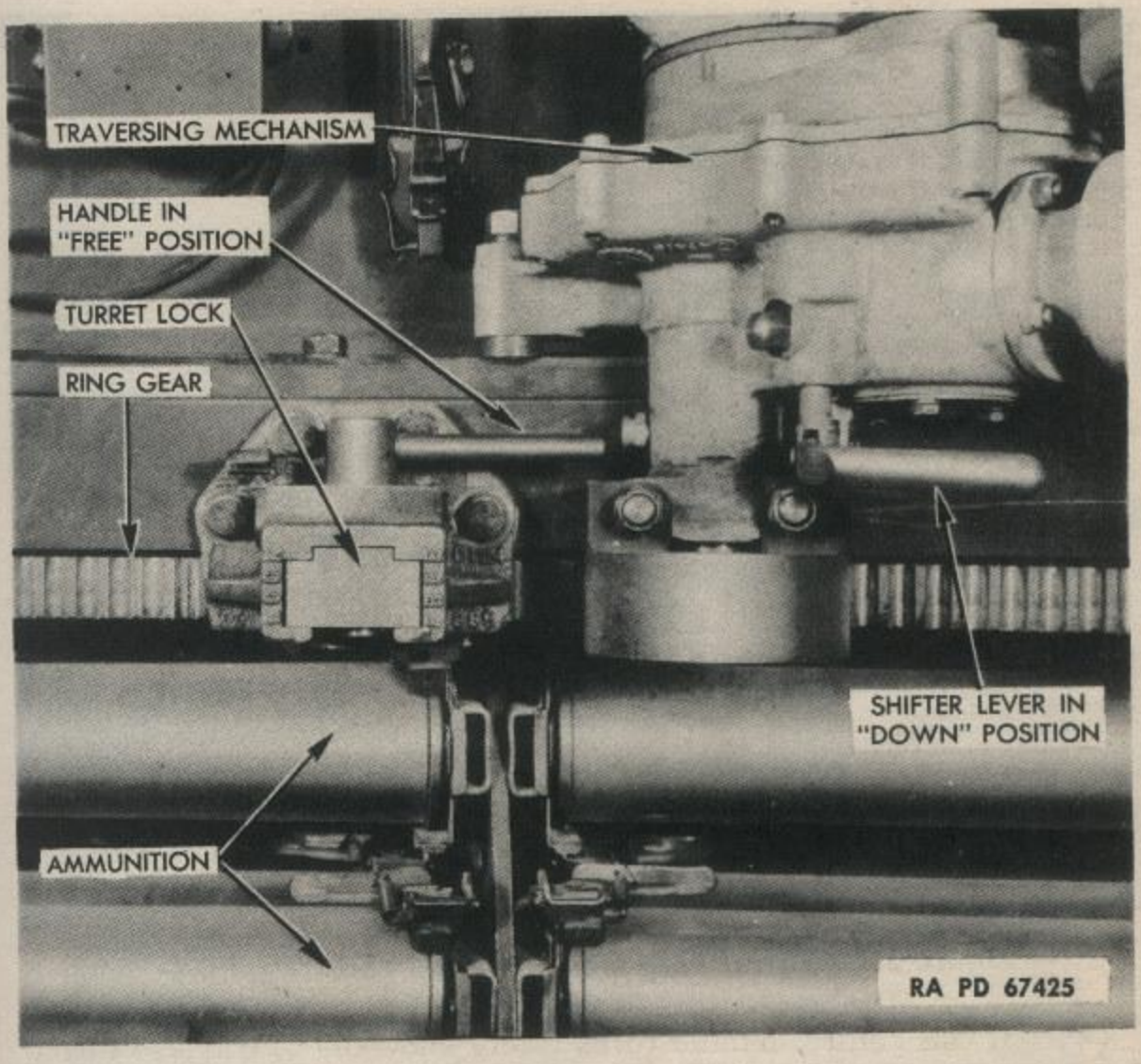


Figure 36 — Turret Ring Gear Lock in "Free" Position

to its rearward position marked "LOCK" and making sure the handle is held by the spring clip (fig. 37). It may sometimes be necessary to rotate the turret slightly to the left or the right to permit gear teeth and lock teeth to mesh when locking turret.

d. Traversing Turret Manually.

(1) Move shifter lever under gear box to "DOWN" position (fig. 36). It may be necessary to turn the vertical or manual traverse control handle on top of gear box (fig. 53) slightly to engage gears. When the shifter lever is in the "DOWN" position, the manually-operated gears are engaged with the turret ring gear and pinion.

(2) Grip the manual traverse control handle and its associate lever on top of gear box to release the turret brake.

(3) Rotate control handle to the left or counterclockwise to traverse turret counterclockwise. Turning control handle to the right or clockwise will traverse turret clockwise.

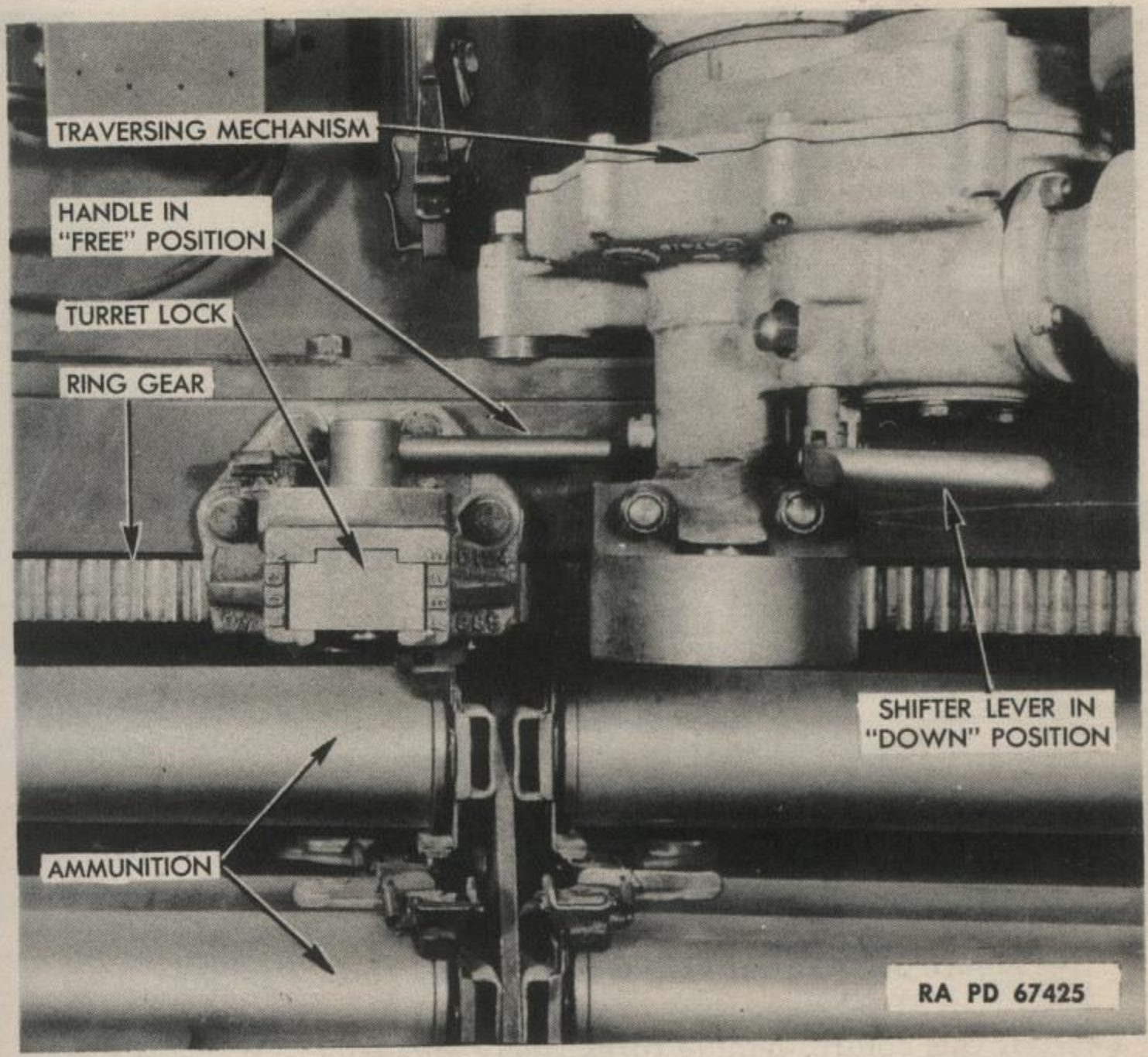


Figure 36 — Turret Ring Gear Lock in "Free" Position

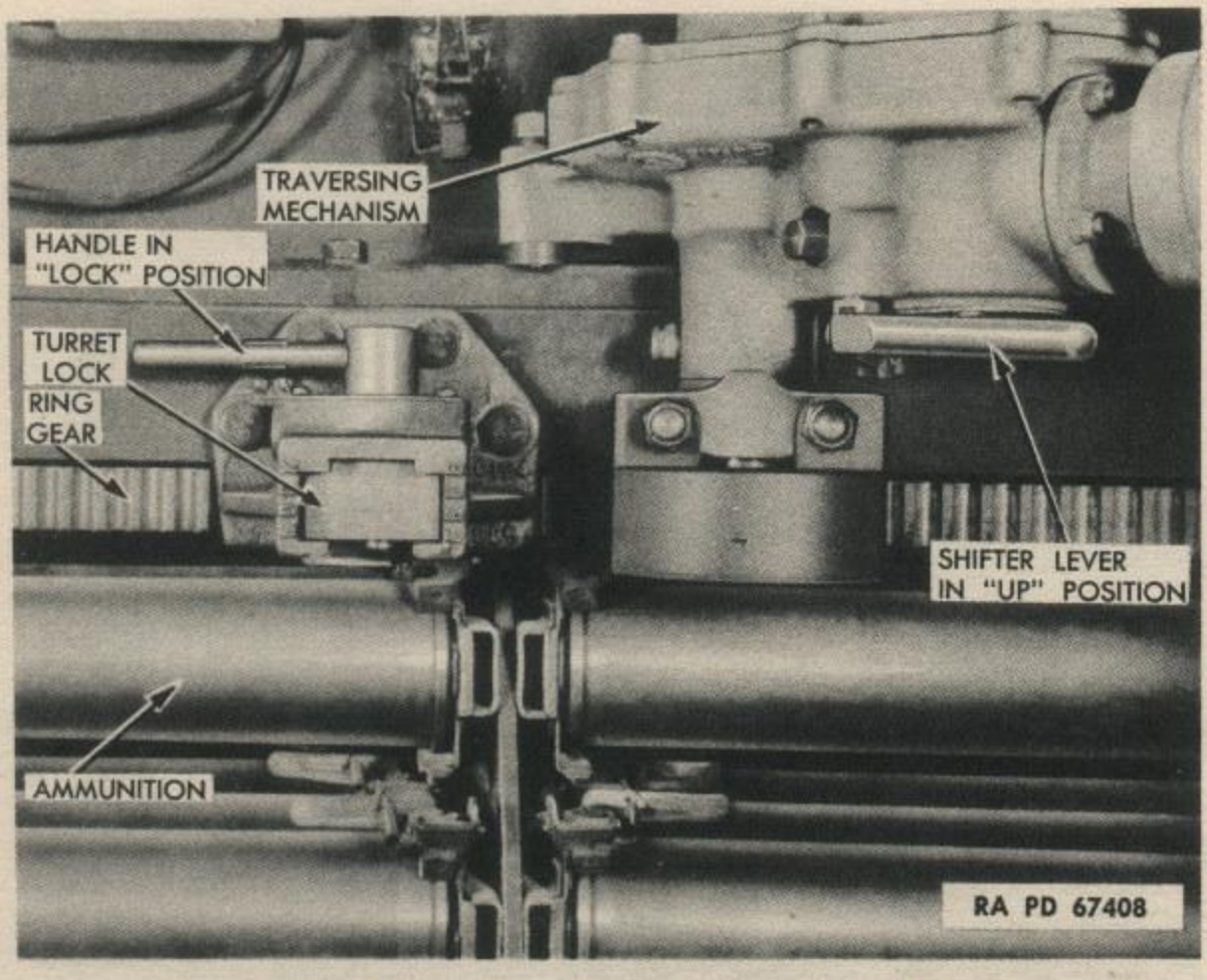


Figure 37 — Turret Ring Gear Lock in "Lock" Position

(4) If this control handle turns freely and fails to traverse turret the shifter lever under the gear box is in the "UP" or power traverse position (fig. 37) and should be moved to the "DOWN" or manual traverse position.

(5) Always traverse turret 360 degrees in both directions to make sure turret is free.

e. Traversing Turret Hydraulically.

(1) Move shifter lever under gear box to "UP" position (fig. 37). It may be necessary to turn the manual traverse control handle on top of the gear box slightly to engage gears (fig. 53). When the shifter lever is in the "UP" position, the power operated gears are engaged with the turret ring gear and pinion.

(2) Turn vehicle master switch located directly behind driver's seat to "ON" position. Two identical switches will be found here; the vehicle switch is the upper one, the lower one being the radio switch.

(3) Turn the turret switch to the "ON" position (fig. 38) to start the electric motor and traverse pump.

(4) To traverse turret clockwise or to the right, turn the top of the traverse control handle to the right. To traverse the turret to

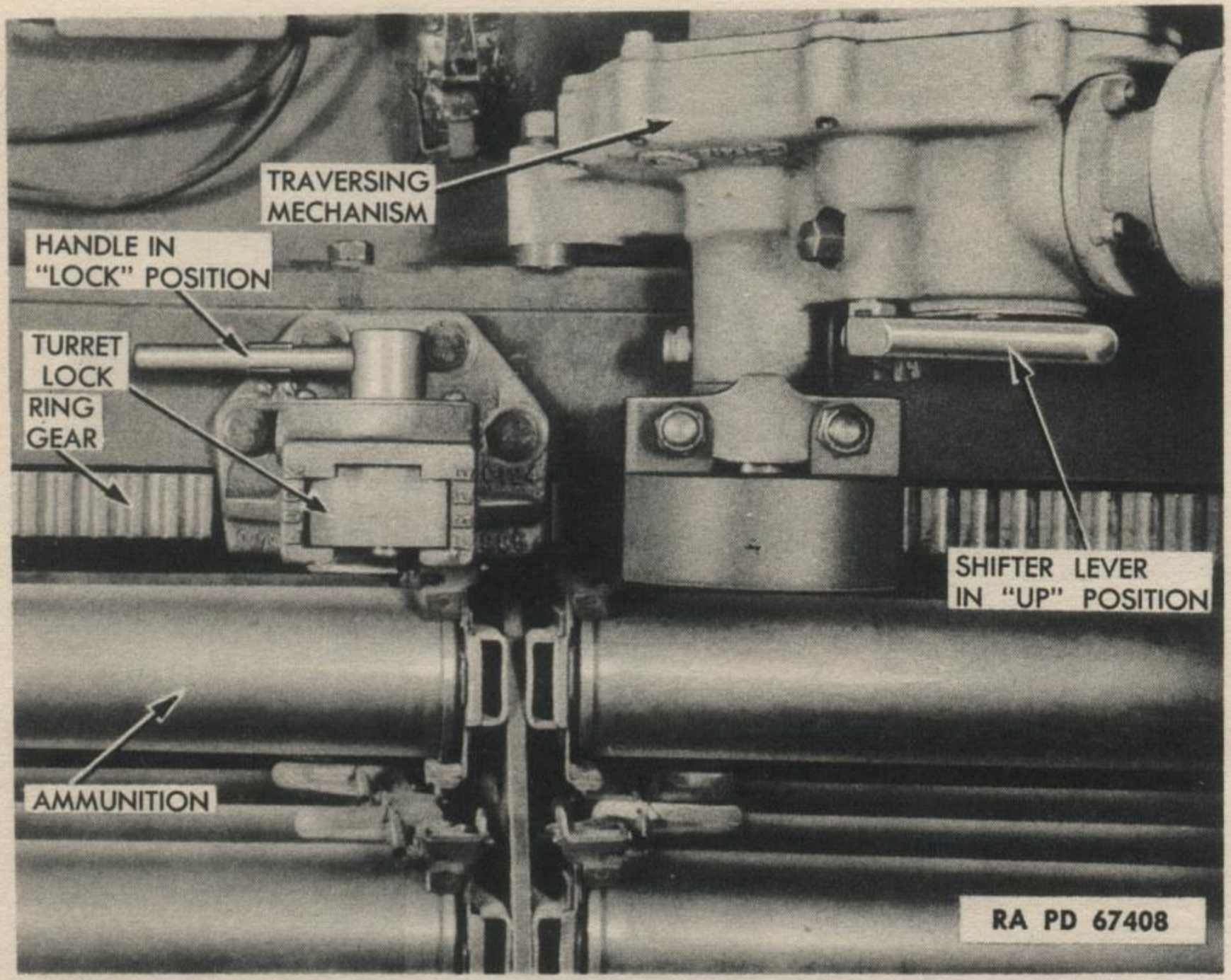


Figure 37 — Turret Ring Gear Lock in "Lock" Position

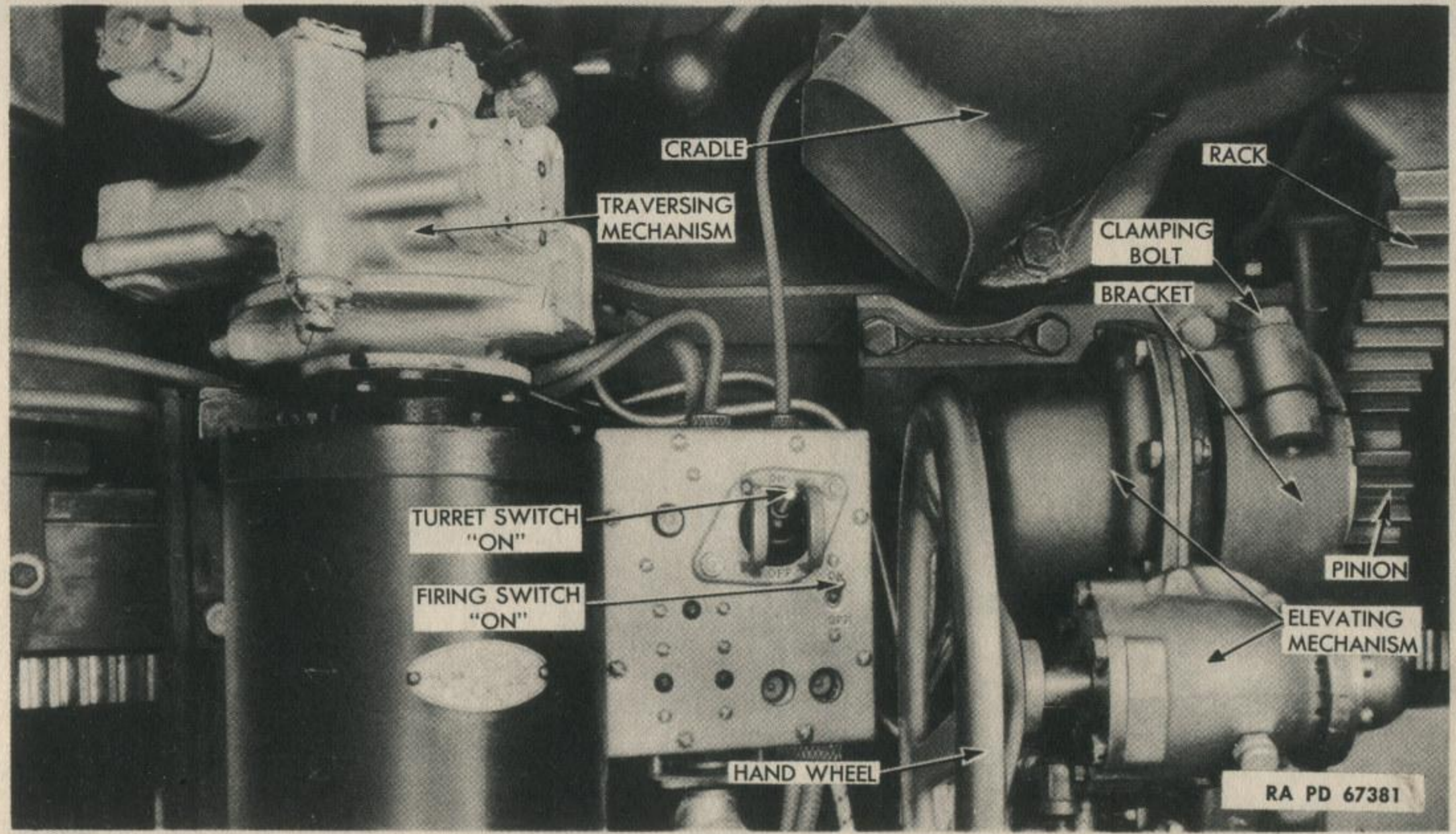


Figure 38 — Turret Switch in "ON" Position

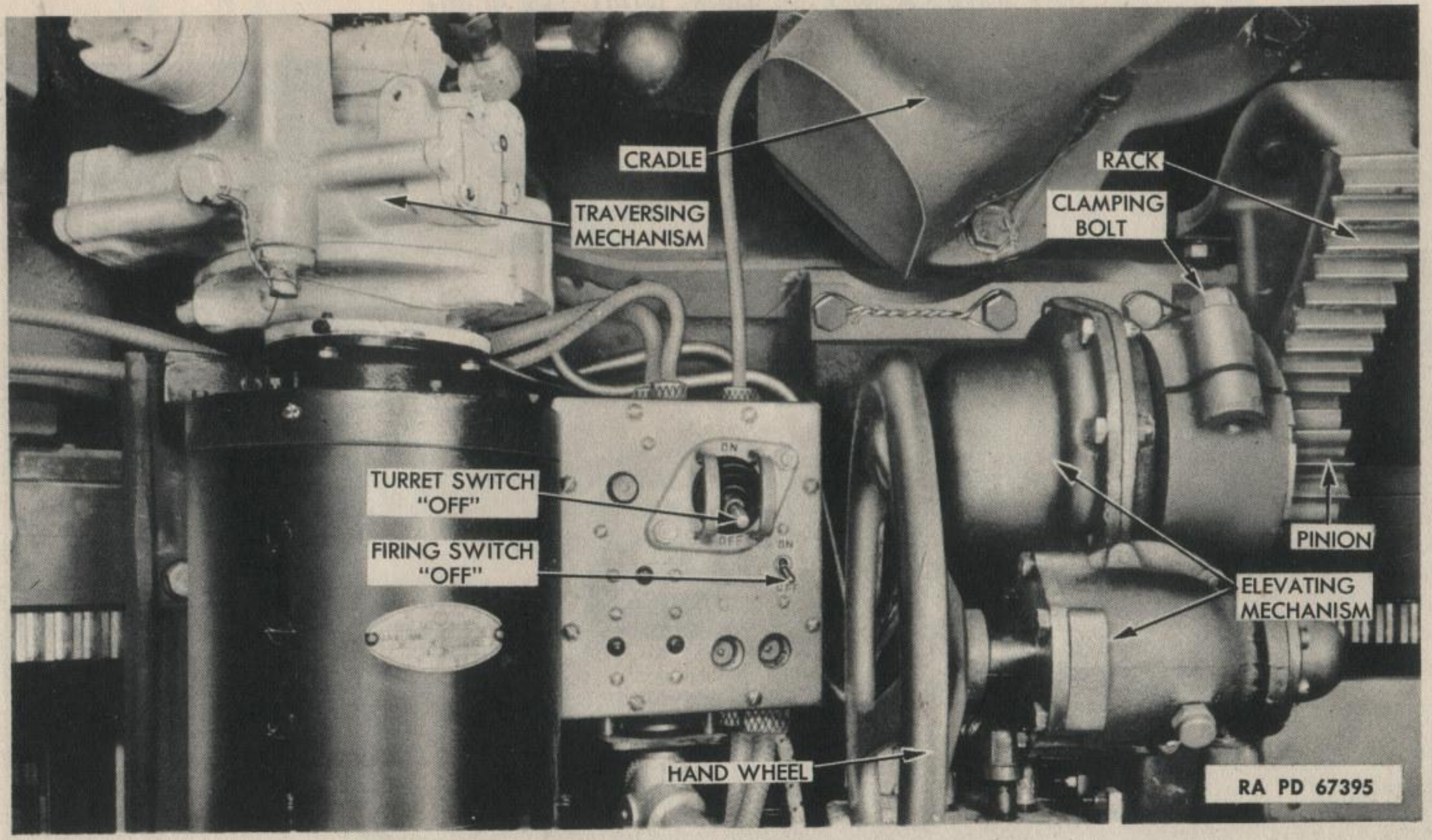


Figure 39 — Turret Switch in "OFF" Position

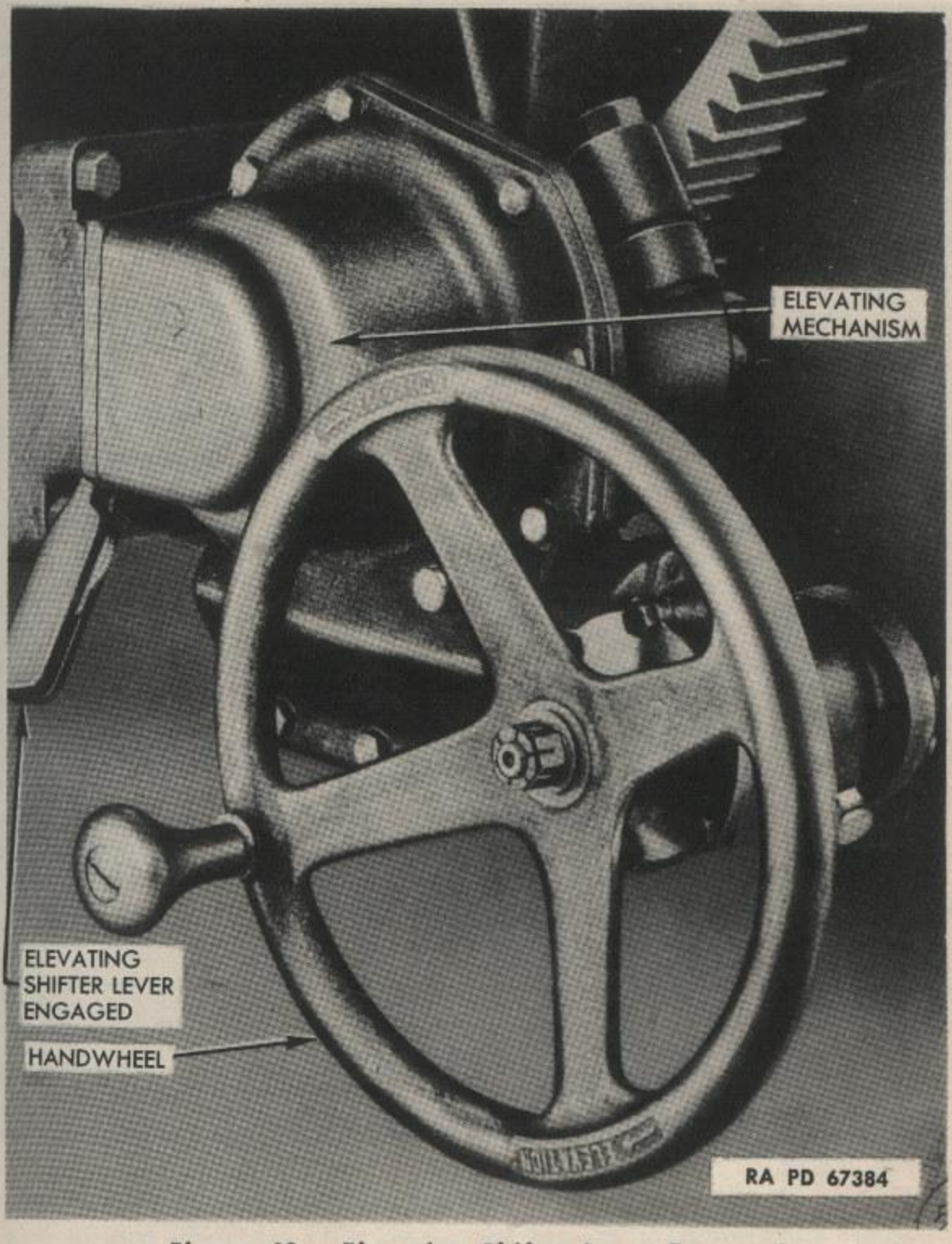


Figure 40 — Elevating Shifter Lever Engaged

the left, turn the handle to the left. The speed of traverse may be increased by turning this handle further to the right or the left depending upon the direction of traverse.

(5) The turret traverse may be stopped by releasing the control handle or bringing it to the upright (neutral) position.

(6) Turret rotation can be reversed instantly without damage to the fluid power mechanism. Automatic hydrodynamic braking is provided.

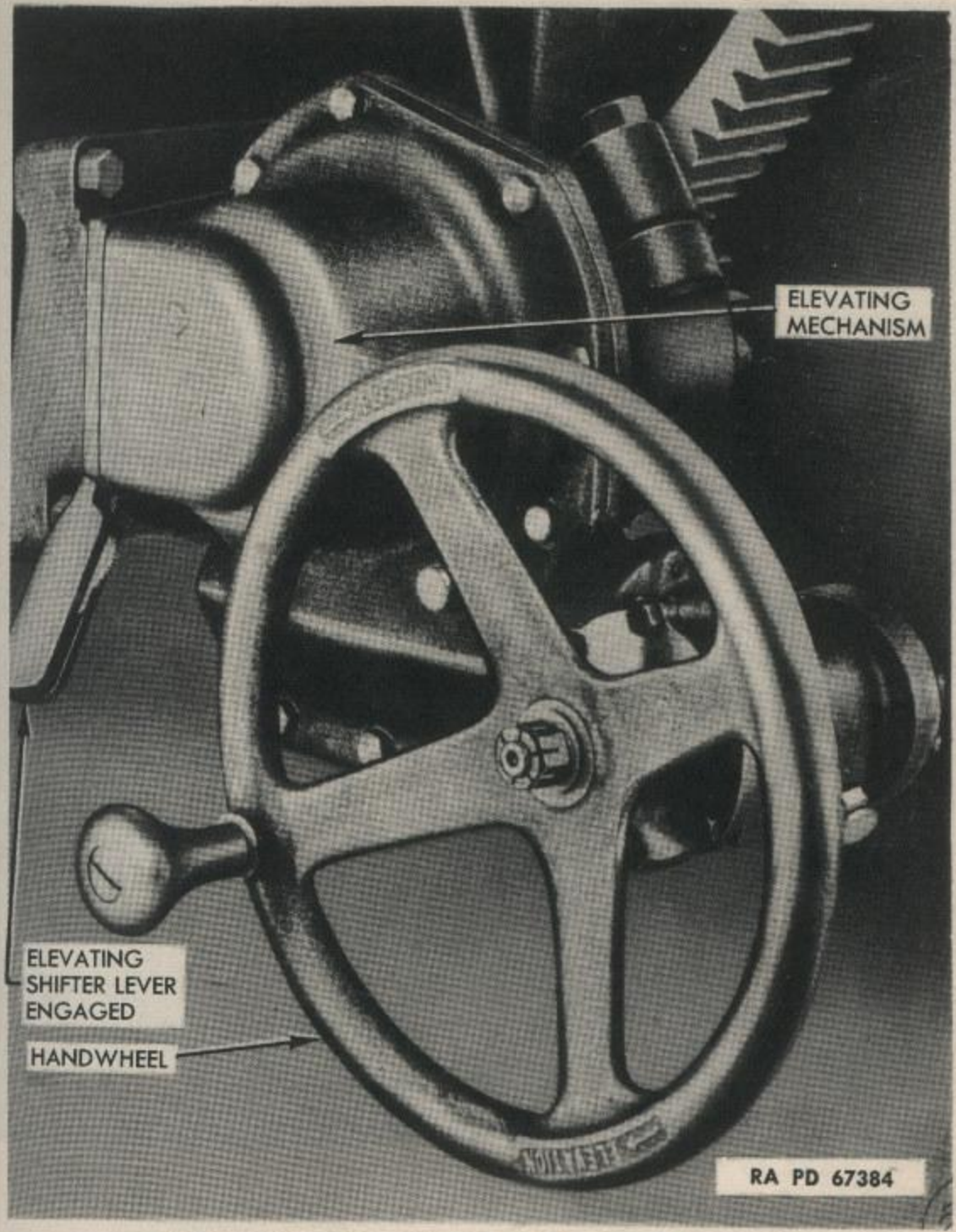


Figure 40 — Elevating Shifter Lever Engaged

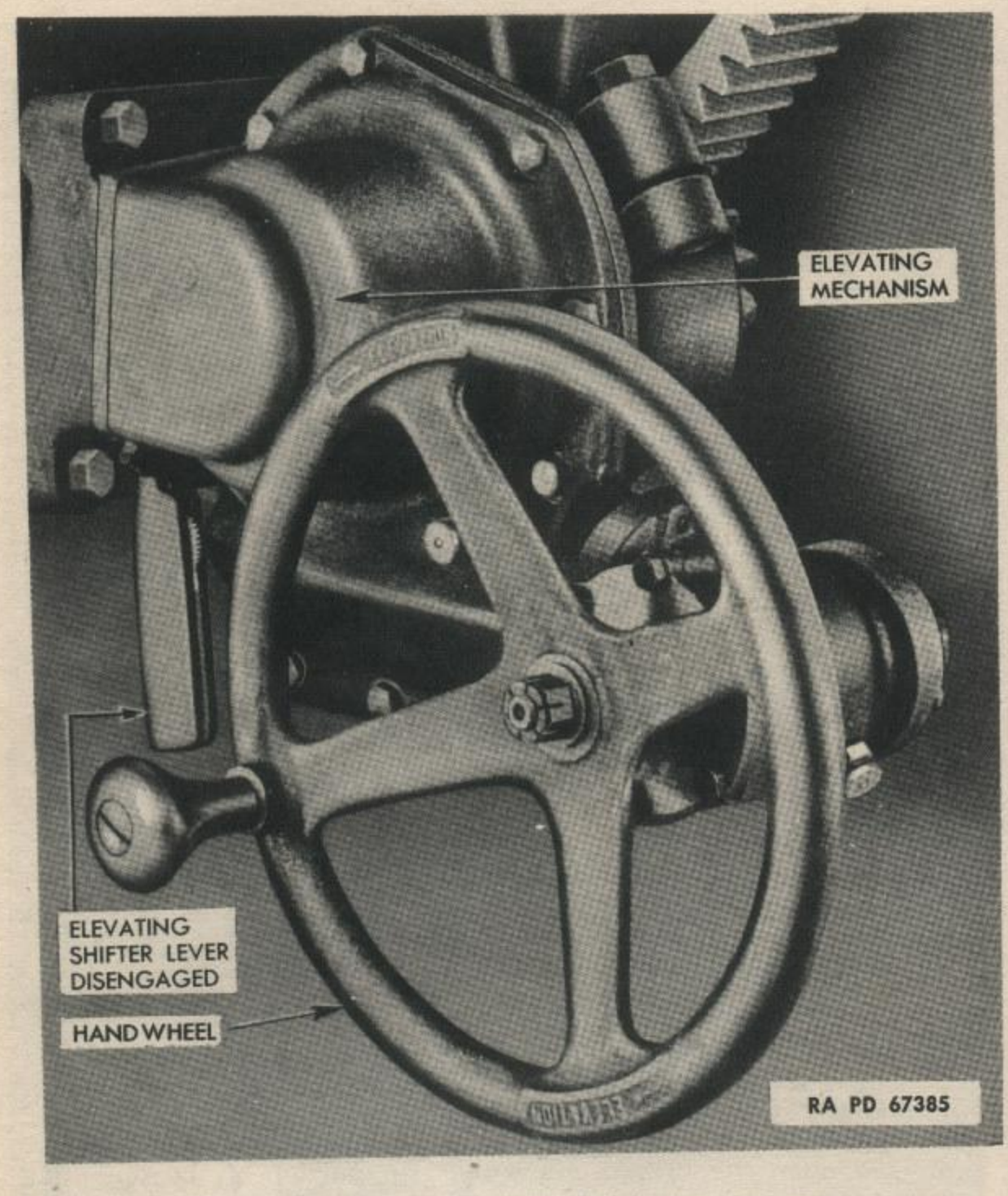


Figure 41 — Elevating Shifter Lever Disengaged

NOTE: Any attempt to traverse the turret hydraulically while the turret lock is engaged will result in a high increase in the temperature of the oil, subject the equipment to undue wear and put an unnecessary drain on the vehicle batteries.

34. ELEVATING GUN.

a. Make sure the elevating gears are meshed. They may be meshed by releasing the trigger on the shifter lever and moving this lever to the left. It may be necessary to turn the elevating handwheel slightly

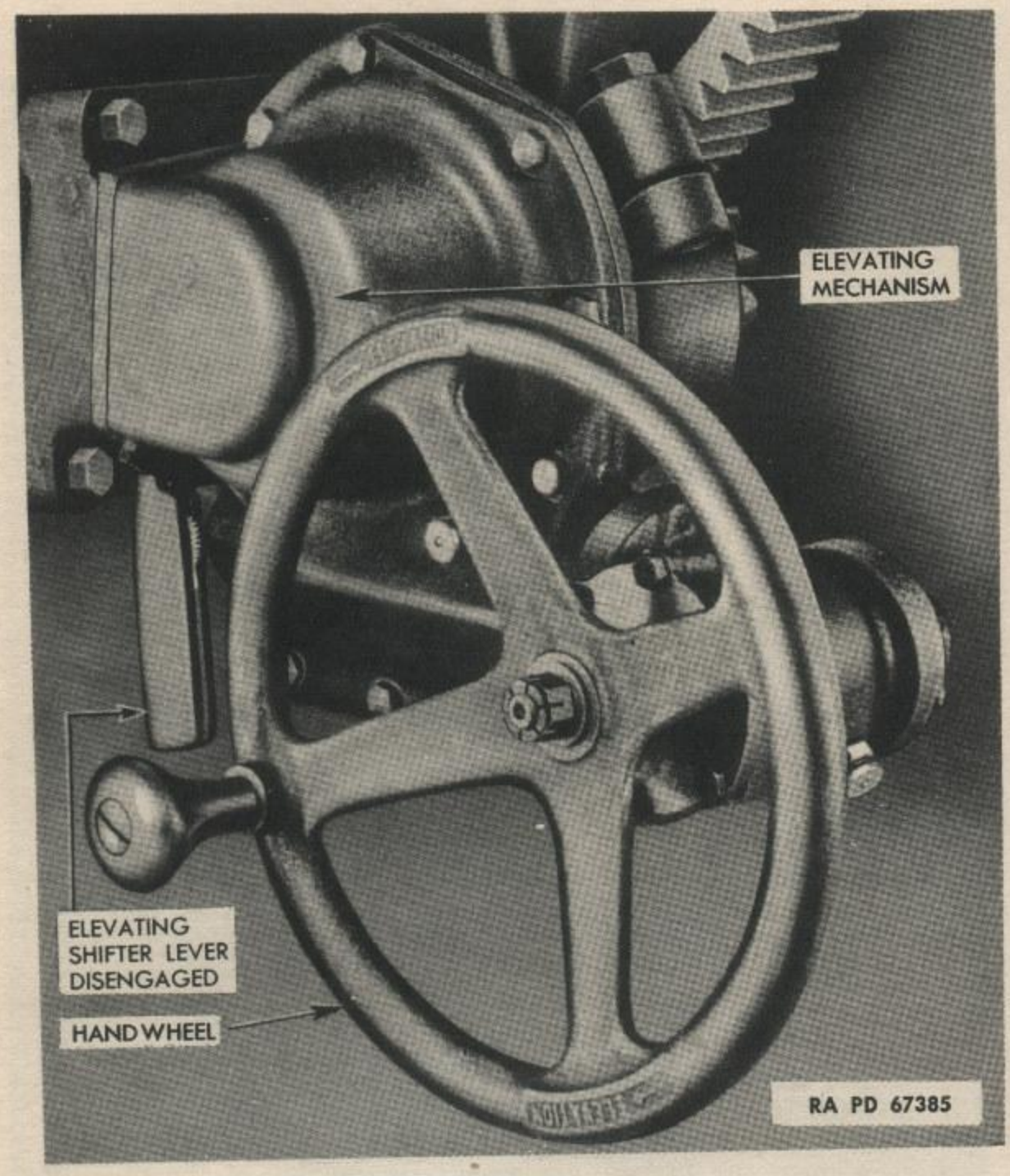


Figure 41 — Elevating Shifter Lever Disengaged

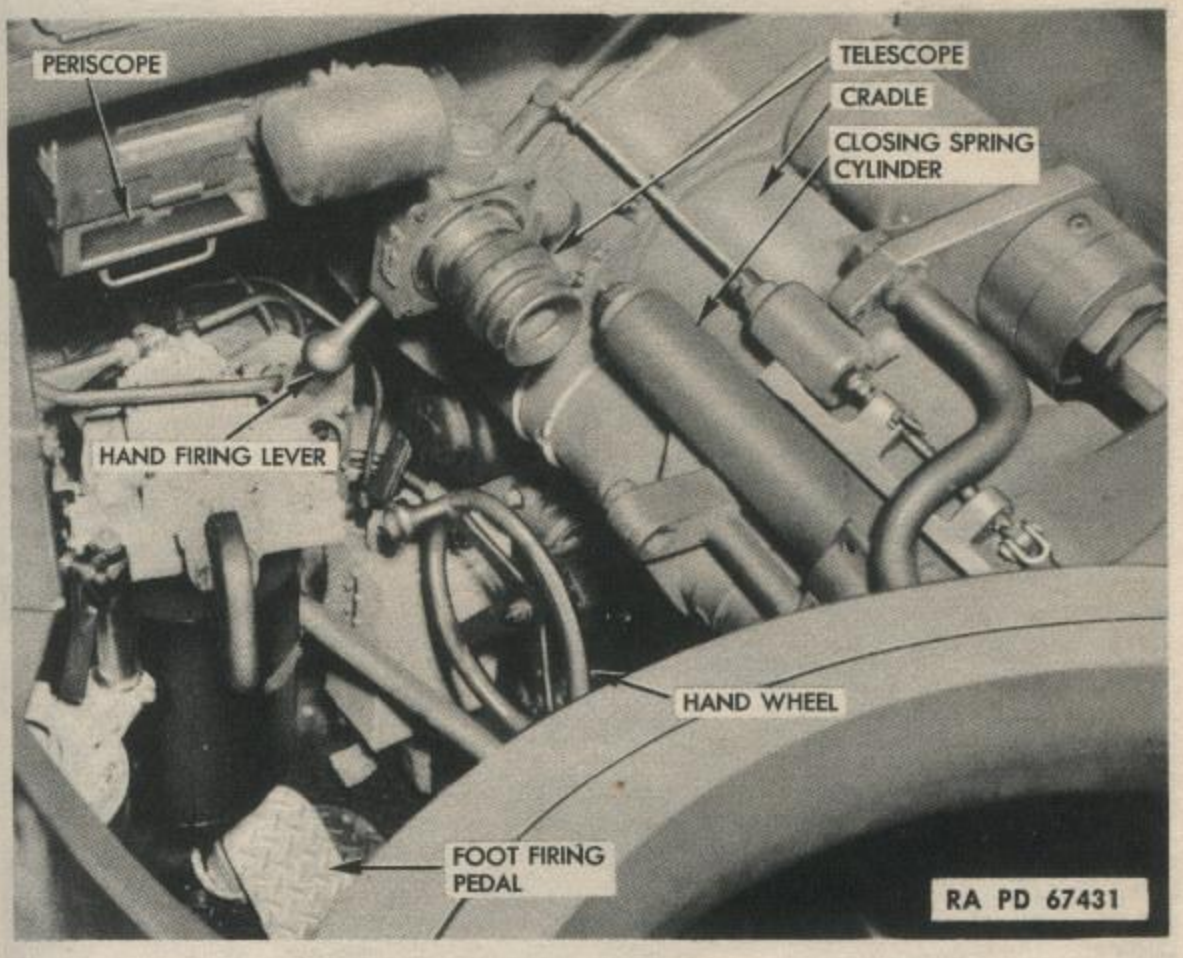


Figure 42 — Gunner's Controls

to permit meshing of the gears when moving the shifter lever (figs. 40 and 41).

b. Elevate gun by turning elevating handwheel. Maximum elevation is 20 degrees, and depression is 10 degrees.

35. LOADING THE GUN.

a. To open the breech, grasp the grip portion of the operating handle, release the latch in the grip and pull the handle downward and toward the rear. This lowers the breechblock and thus opens the breech.

CAUTION: Keep hands out of gun when breech is open.

b. To load the gun, place a round in the breech with the nose protruding into the bore and impel into the chamber with sufficient force so that the flange of the cartridge case will drive the extractors forward and automatically close the breech.

c. If the breechblock fails to close, follow the instructions prescribed in paragraphs 60 and 61.

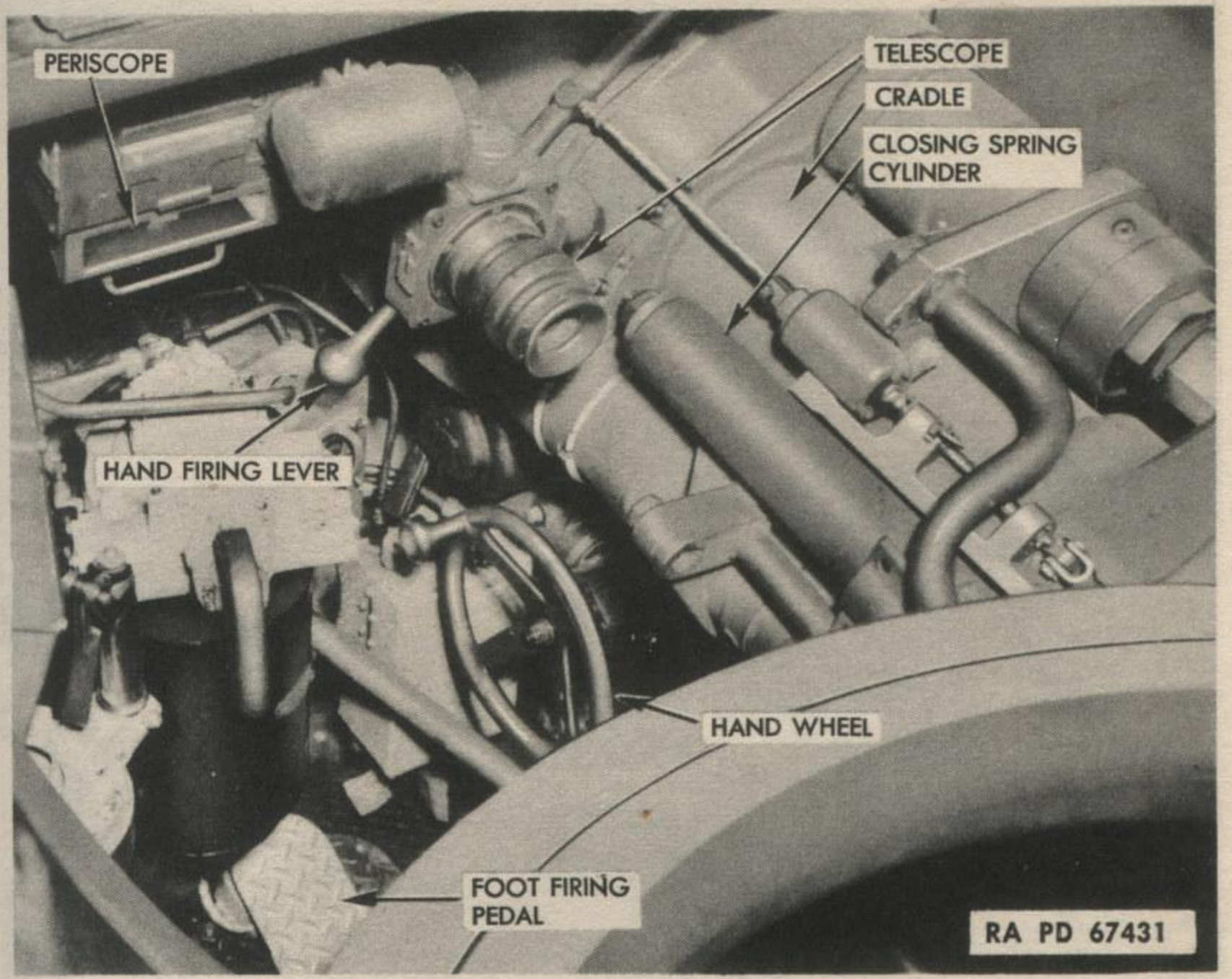


Figure 42 — Gunner's Controls

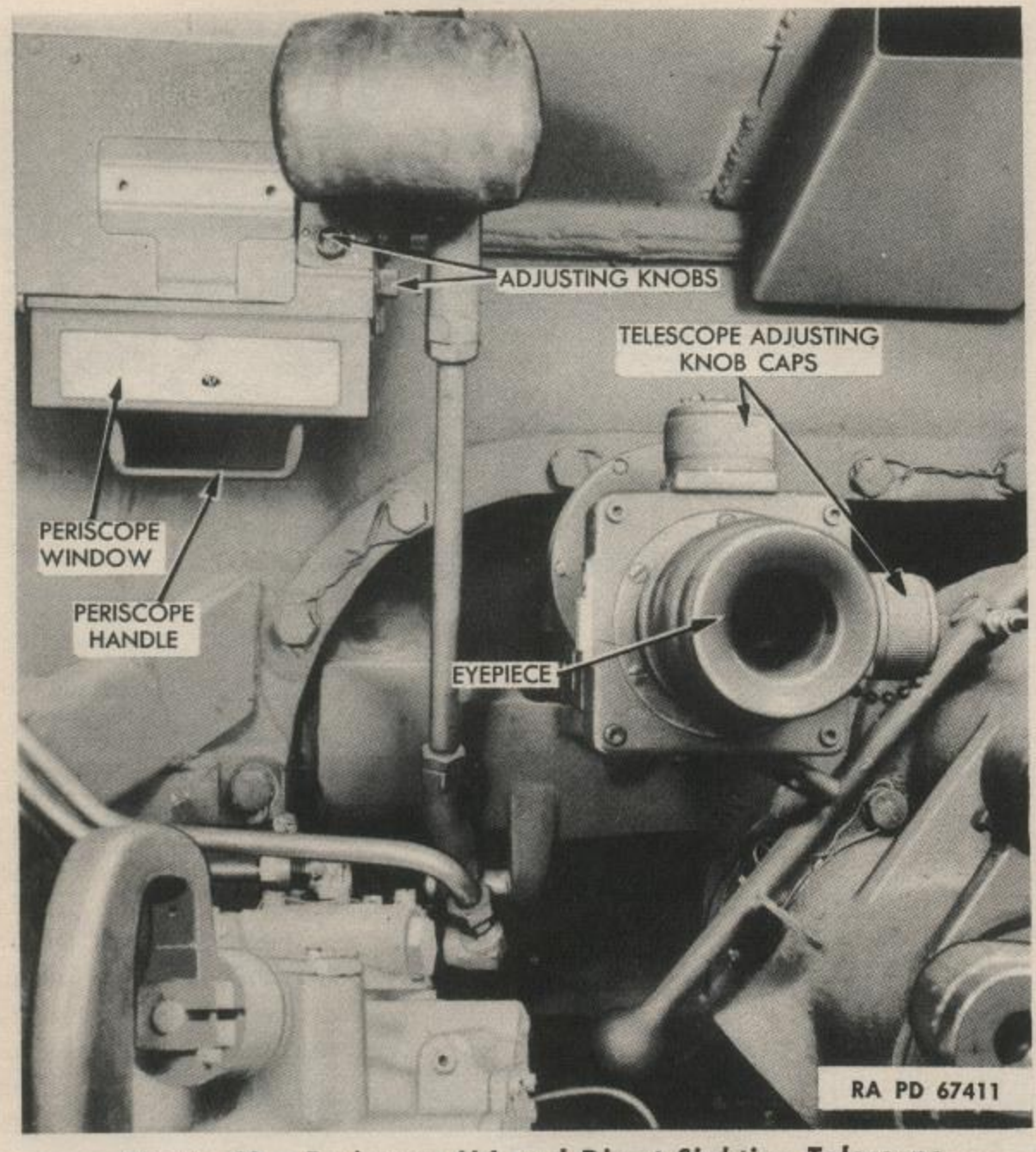


Figure 43 — Periscope M4 and Direct Sighting Telescope

d. The loader's hand should be moving upward as he pushes the cartridge into the chamber in order to clear the breechblock which will raise automatically. If the firing pedal is held depressed, the round will be fired as soon as the breechblock raises to closed position, and therefore care should be taken that the loader's hand clears the recoiling gun.

36. FIRING THE GUN.

a. General. Locate the target by observation through the periscope. Pick up the target through the telescope by traversing turret and elevating or depressing gun. Estimate the range. Continue traversing and elevating the gun until the reticle markings fall on the desired point and the gun is aimed ready to fire.

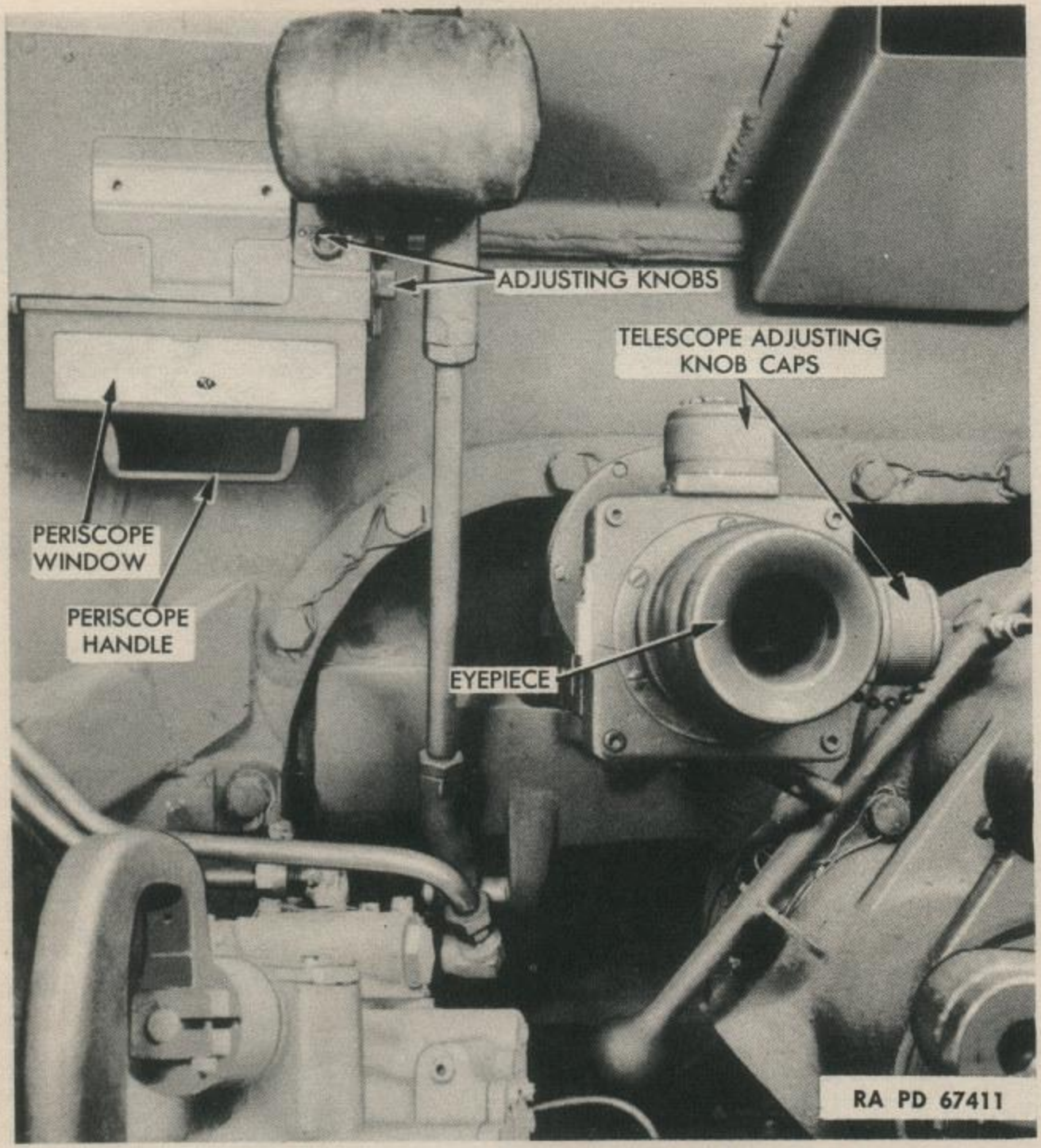


Figure 43 — Periscope M4 and Direct Sighting Telescope

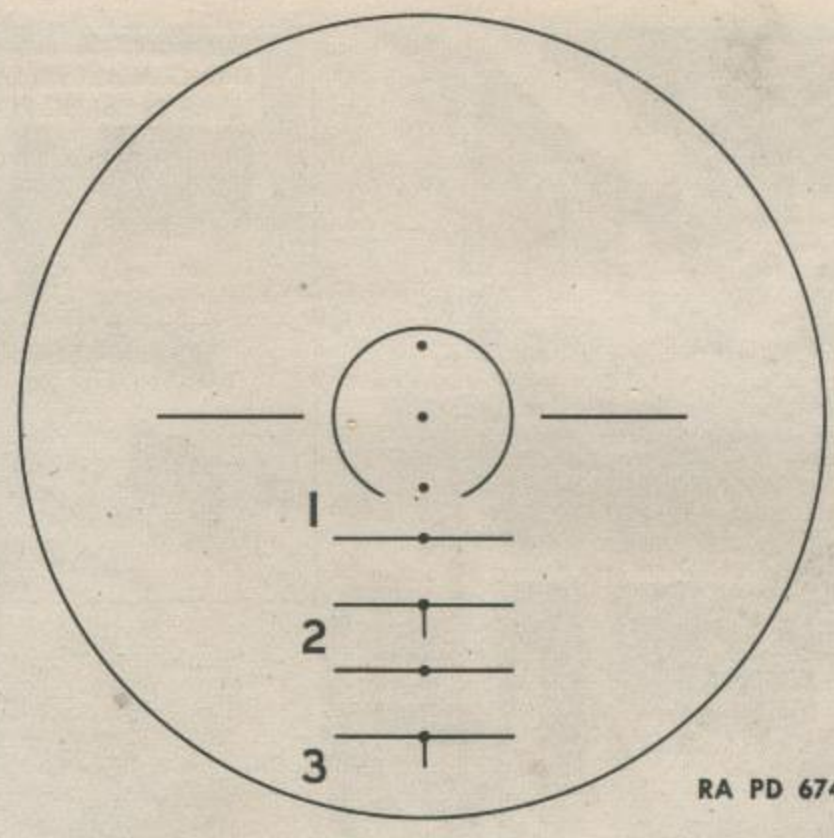


Figure 44 — Reticle Pattern

b. Firing. Make sure the muzzle cover is removed and that loading is completed before firing. Place firing shaft release lever toward rear in firing position (fig. 45). To fire, depress the foot firing pedal mounted on the gunner's platform (fig. 42). If the round fails to fire, do not open the breech. Recock gun (par. 37) and attempt to fire again. If the click of the firing pin is not heard, again operate the firing pedal, noting whether or not the solenoid operates. If the solenoid operates, follow instructions prescribed in section VIII. If the solenoid does not operate, the gun may be fired manually by retracting the hand firing lever mounted on the top of the cradle (fig. 42).

c. While firing the gun observe the functioning of the recoil cylinders and if improper action is noted, take corrective steps as prescribed in paragraphs 60 and 62.

37. RECOCKING THE GUN.

a. Recocking the gun is usually unnecessary except under special conditions such as a misfire.

b. To recock the gun push upward and forward on the cocking lever which projects rearward over the top rear wall of the breech ring.

38. UNLOADING THE GUN.

a. Remove a live round from the chamber by opening the breech as in paragraph 35 **a.**

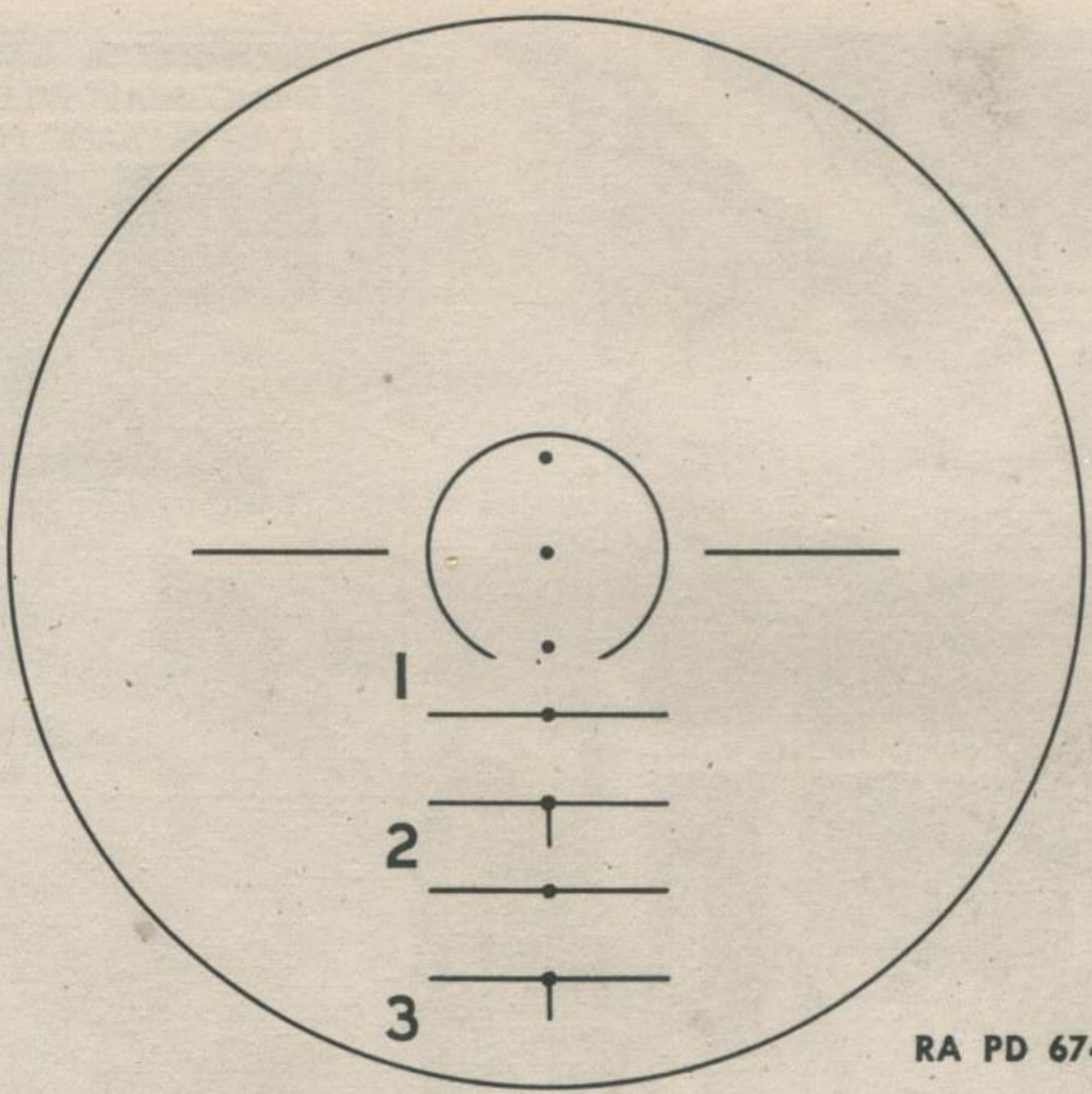


Figure 44 — Reticle Pattern

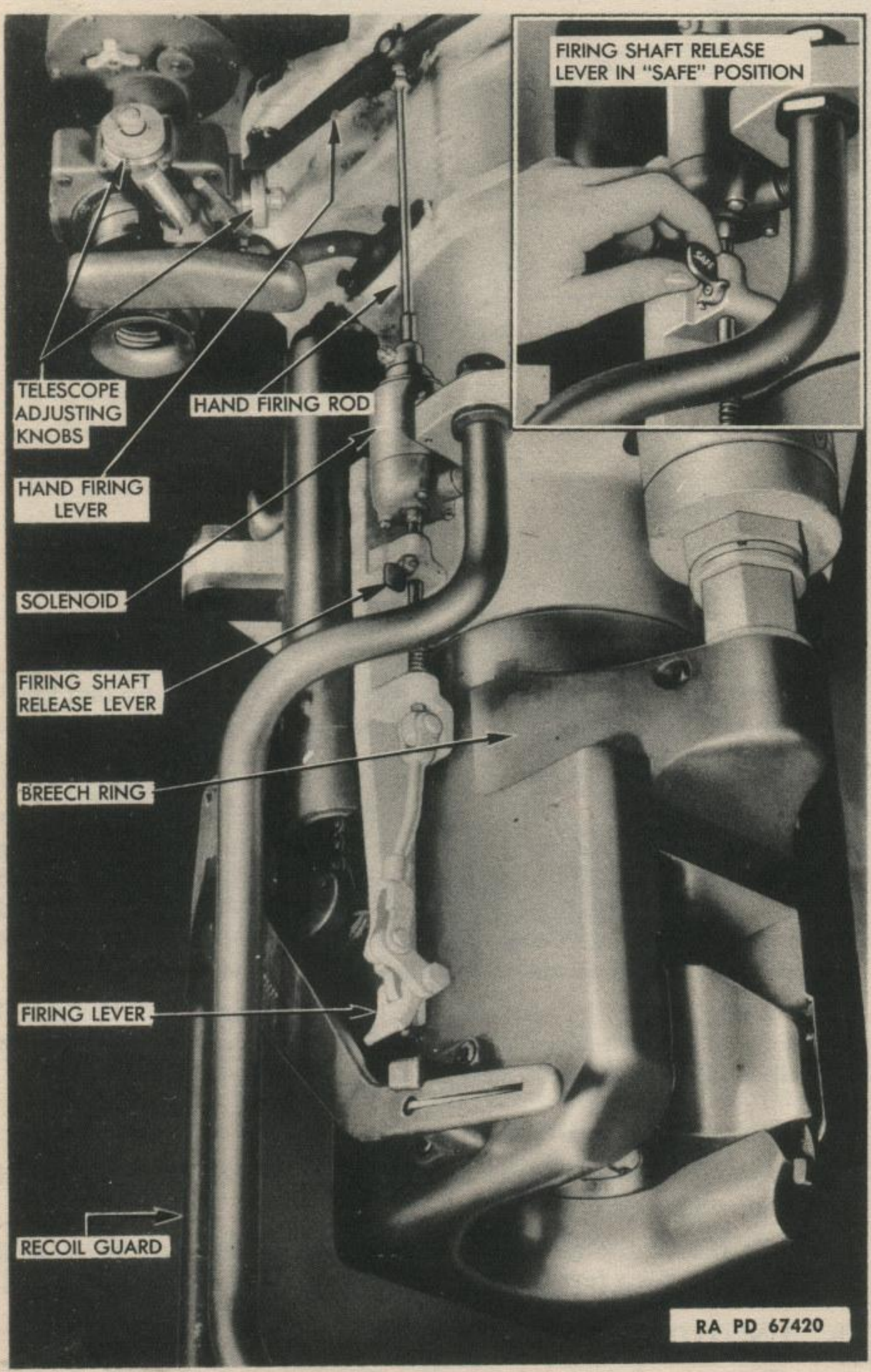


Figure 45 — Firing Shaft Release Lever in "Firing" Position

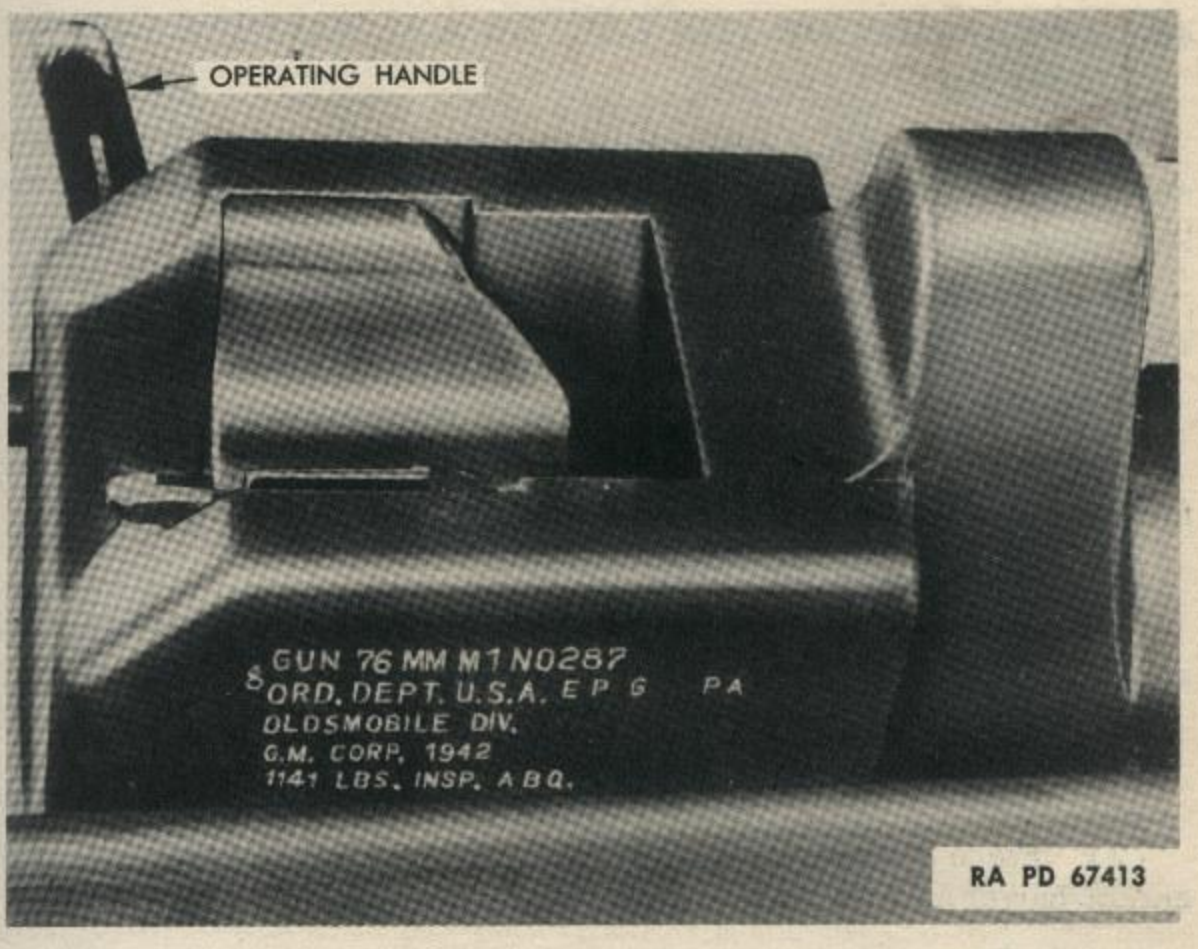


Figure 46 — Operating Handle and Cocking Lever

b. Close the breech by moving the operating handle upward and toward the front. Bear sufficient weight on the handle to overcome the force of the closing spring and release the extractors from their locking position by pressing them forward with the base of an empty cartridge case.

CAUTION: Do not use hands to release extractors. The breechblock is forced into battery position by the closing spring and this movement should be controlled by means of the operating handle. Always keep operating handle latched in the stop except when being used to operate the breechblock or service the gun (fig. 9).

39. PLACING GUN IN TRAVELING POSITION.

a. After firing, place firing shaft release lever in the forward or "SAFE" position (fig. 45).

b. Traverse turret until gun points forward and attach traveling bar to yoke on cradle (fig. 34).

c. When traveling in its stowed condition, the gun should first be cleaned and oiled and all covers installed (figs. 47, 48, and 49). Engage turret ring lock and disengage elevating gears by moving shifter lever to the right position (figs. 37 and 41).

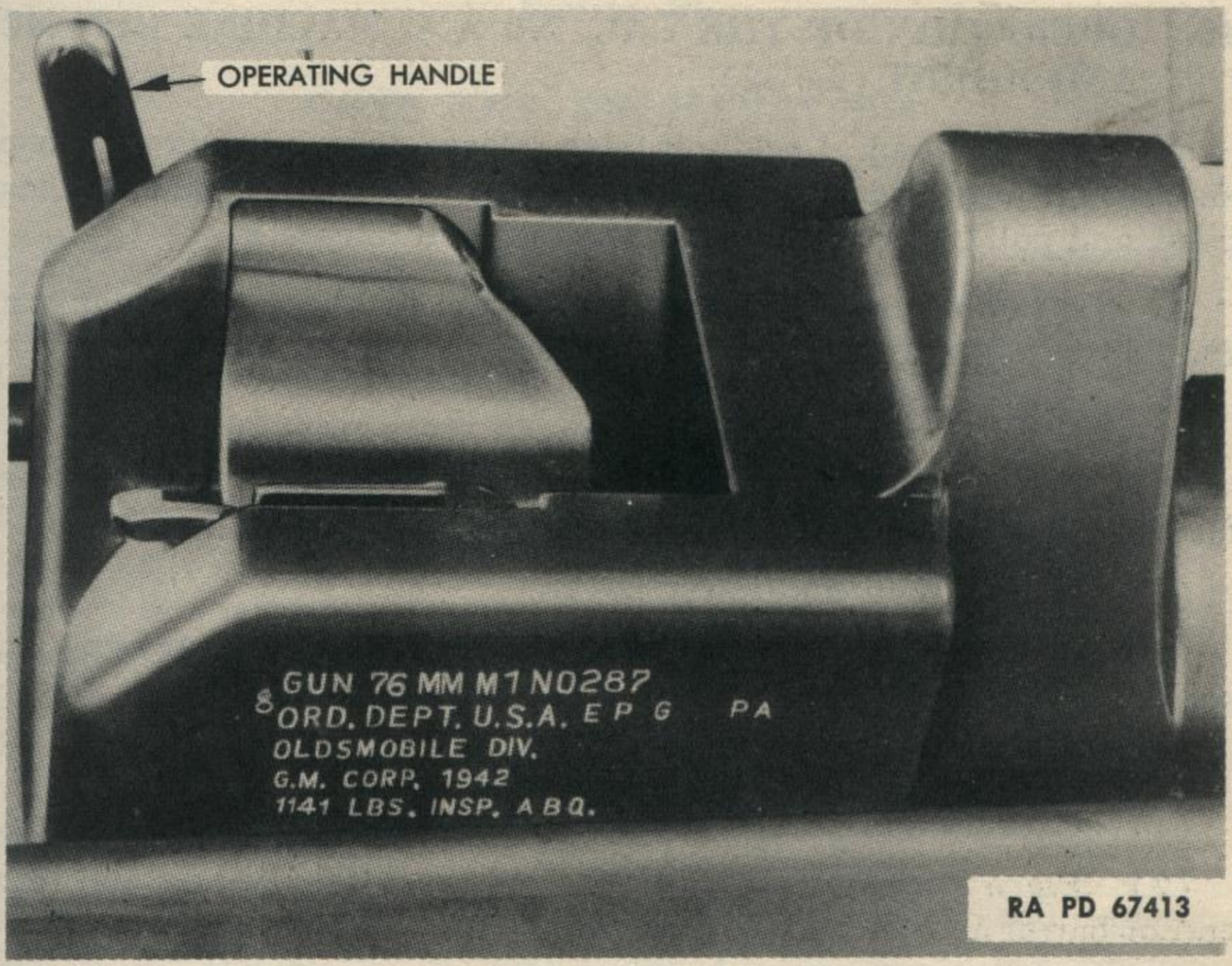


Figure 46 — Operating Handle and Cocking Lever

40. OPERATION OF THE CAL. .50 A.A. MACHINE GUN M2 AND MOUNT (fig. 32).

a. To Half Load. Lock bolt latch release down, push double loop end of belt into feedway until the first round is held by belt holding pawl, and pull bolt completely to the rear and release it.

b. To Load. Load is executed the same as half load except that the bolt is pulled to the rear and released twice.

c. To Unload.

(1) Lift cover, remove belt, retract bolt, and look or feel in the feedway, T-slot, and chamber to make certain that gun is unloaded.

(2) Release bolt and lower cover.

(3) Press trigger or sear mechanism to relieve tension on firing pin spring.

d. To Clear Gun.

(1) Execute that part of unloading described in step **c** (1), above.

(2) Place a wooden clearing block between face of bolt and rear end of barrel and let bolt go forward.

e. To Fire.

(1) SEMIAUTOMATIC ACTION. By unlocking bolt latch release and alternately pressing trigger and bolt latch release, semiautomatic fire can be obtained.

(2) AUTOMATIC ACTION. Lock bolt latch release down and press and hold trigger down. (To fire single-shot, automatic action, slide the thumb off quickly after pressing trigger.)

f. To Elevate Gun. The gun can be elevated and depressed manually whenever the traveling lock pin is disengaged. To disengage this lock, pull outward on the lock handle sufficiently for guide pins to clear the deep notch in the guide, turn handle ¼ turn and allow guide pins to rest in the shallow notch.

g. To Traverse Gun and Mount. The ring mount will traverse freely whenever the ring brake is released. Rotating the brake handle a few turns counterclockwise releases this brake. Rotating the handle clockwise engages the brake and locks the ring mount.

Section VI

CARE AND PRESERVATION

	Paragraph
General	41
Care of 76-mm gun M1	42
Care of 76-mm gun mount T1	43
Care of cal. .50 A.A. machine gun and mount	44
Spare parts and accessories	45
Recoil cylinders	46
Recoil oil	47
Lubrication	48
Reports and records	49
Cleaning and preserving materials	50
Paints and related materials	51
Preservation of the materiel in storage	52

41. GENERAL.

a. This section covers the cleaning, lubrication, care and preservation of the 76-mm Gun M1 and Mount T1, the cal. .50 A.A. Machine Gun M2 and mount, and armament spare parts and accessories carried in 76-mm Gun Motor Carriage T70.

b. Care and preservation of the sighting system will be found in section XII.

c. Dust or dirt must not be allowed to accumulate on, in, or around the materiel. Dirt and sand are particularly detrimental to highly polished parts such as bearing surfaces and gears. Wear inside a gun tube does not depend entirely upon the number of rounds fired. It depends to a great extent upon the care given the bore. Proper cooling, cleaning and lubricating will help to reduce copper fouling when firing the gun.

d. When the materiel is not in use, all protective covers should be in place (figs. 47, 48, and 49).

e. If the materiel is to be unused for a considerable length of time, all bright unpainted surfaces should be cleaned with SOLVENT, dry-cleaning, thoroughly dried and protected with a coat of COMPOUND, rust-preventive, light.

f. Precautions When Removing Parts for Inspection or Replacement.

(1) Clean grit, mud and dirt from all parts to be removed as well as nearby parts.

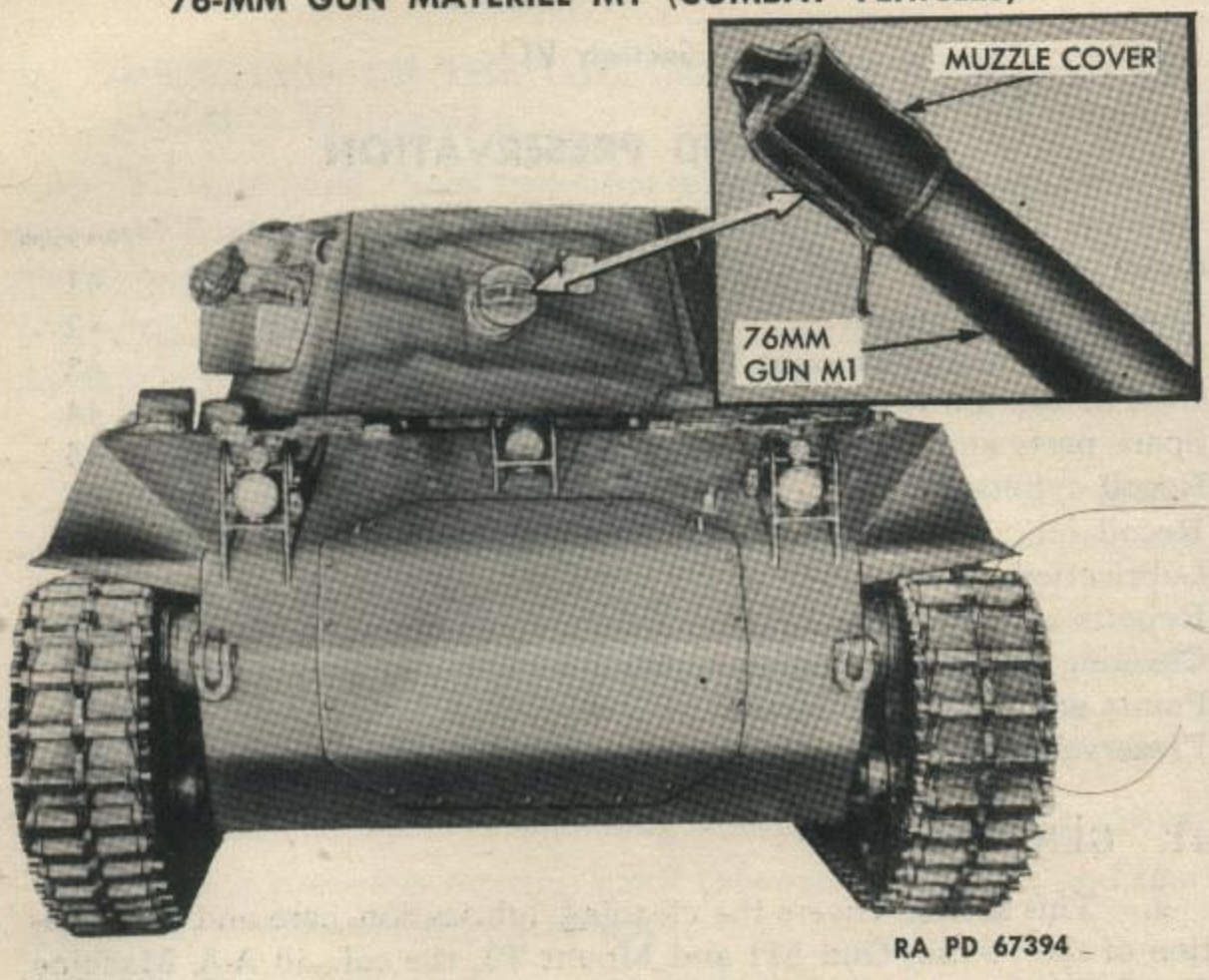


Figure 47 — Shroud and Muzzle Cover Installed

(2) Keep tools and hands clean and free from grit.

(3) Be careful that clothing does not brush sand or dirt into assemblies or openings in parts.

(4) Clean parts before oiling and assembling.

(5) Do not use a steel hammer directly on any part of the gun or mount. Use copper or lead hammer, if available, or use a wooden block for a buffer.

g. Precautions When Washing Gun or Mount.

(1) High pressure hose must never be used.

(2) Water must not be played into the breechblock or into bearings.

(3) Carefully dry parts that have become wet, then oil them as prescribed in paragraph 48.

42. CARE OF 76-MM GUN M1.

a. Care of Bore.

(1) Before firing wipe out the bore to insure that it is clean and dry.

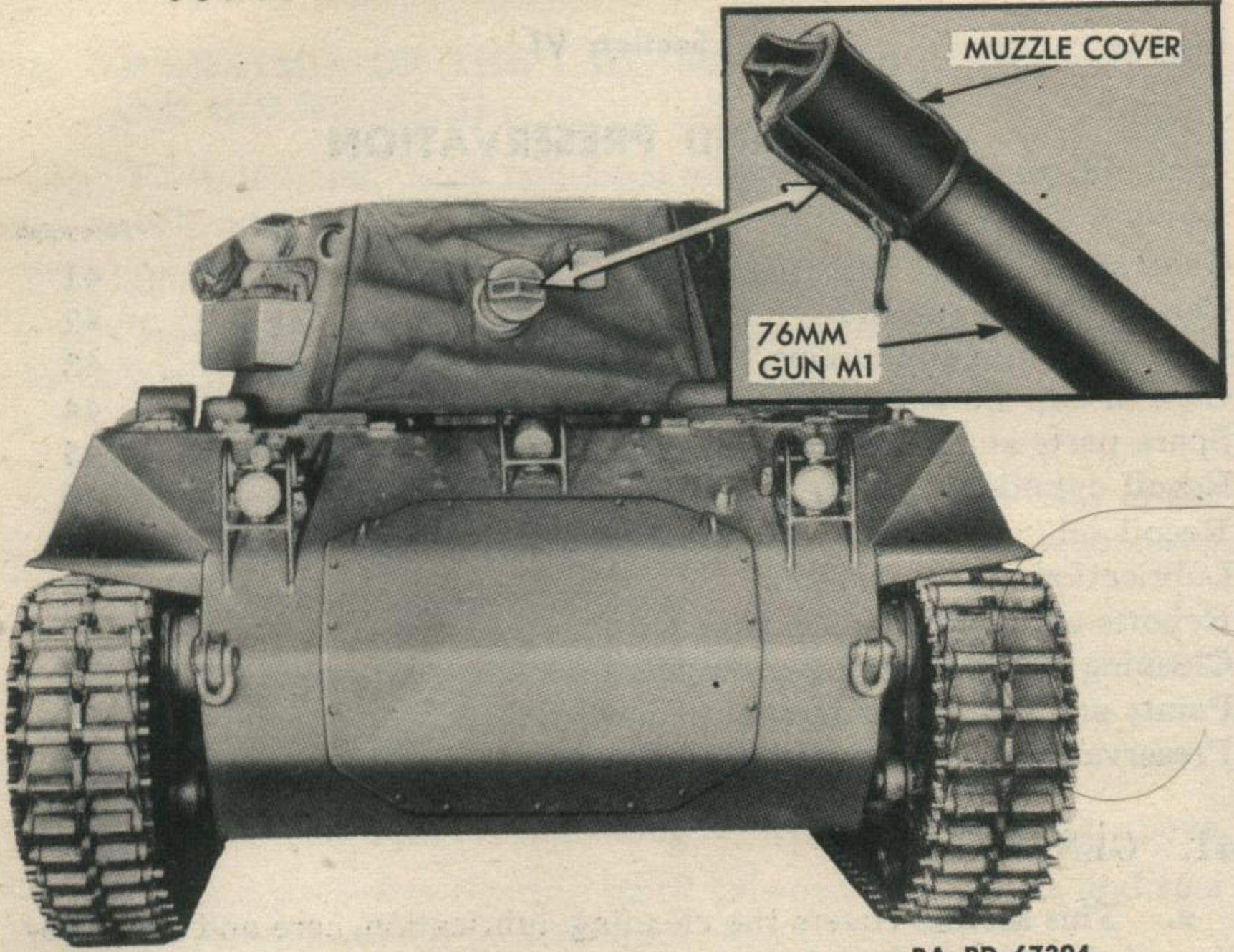


Figure 47 — Shroud and Muzzle Cover Installed

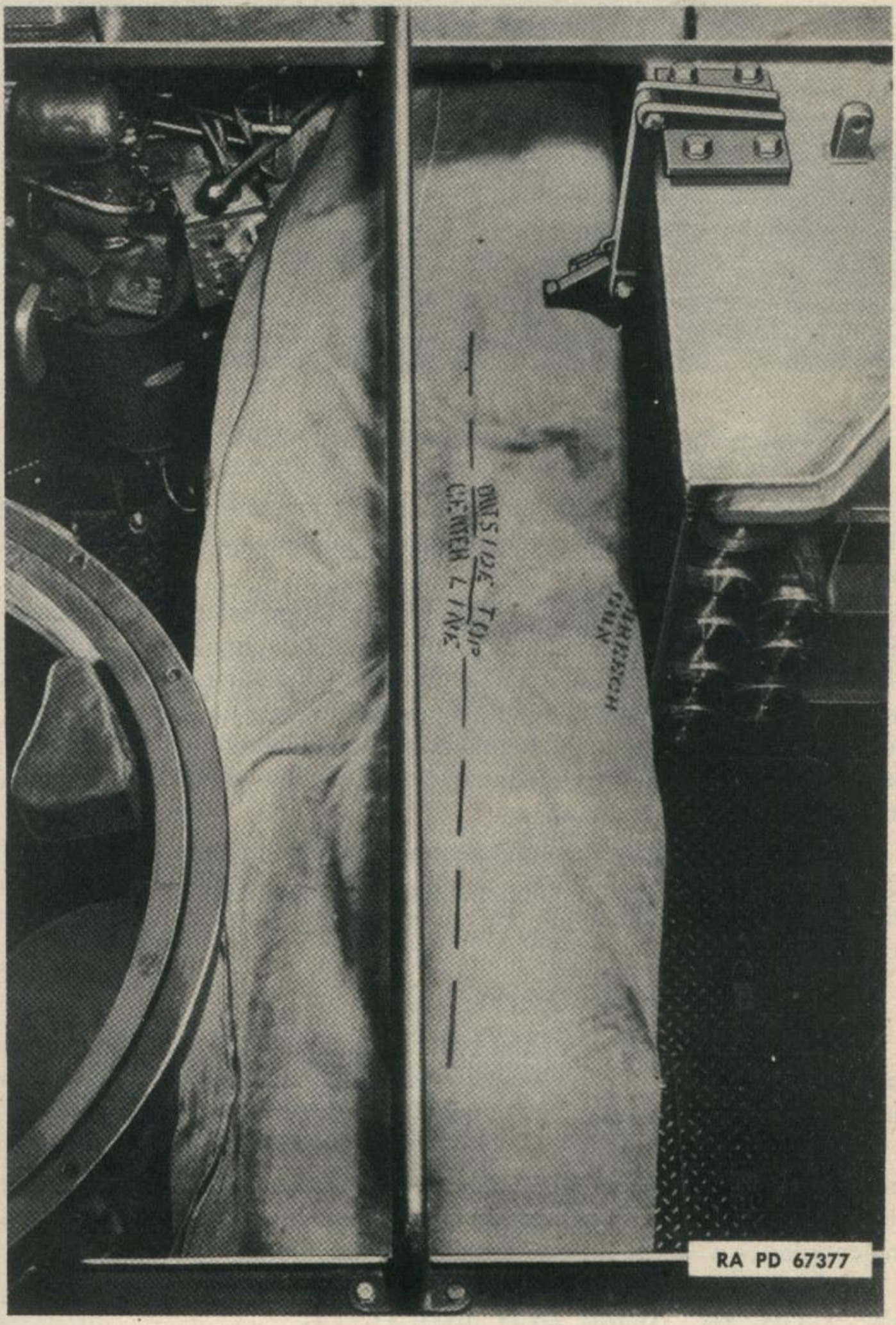
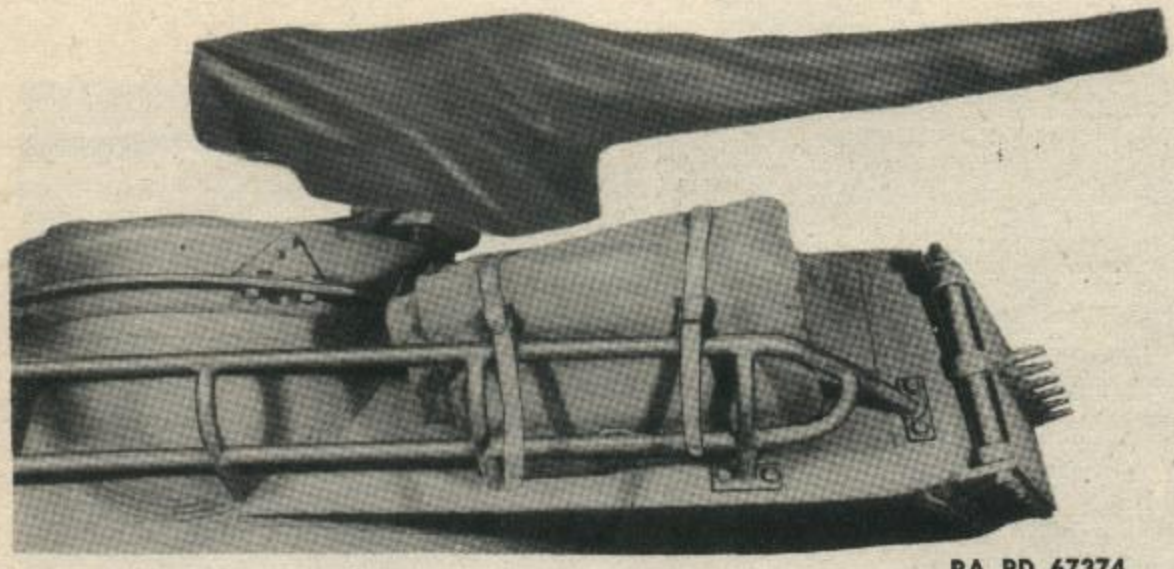


Figure 48 — Breech Cover, 76-mm Gun, Installed



RA PD 67374

Figure 49 — Cal. .50 Machine Gun M2, Cover Installed

(2) During firing, whenever the rate of fire will permit, examine the bore for fouling and metal deposits. Clean with bore brush if necessary.

(3) After firing, wash the bore with a solution made in the proportion of ½ pound SODA ASH, or 1 pound sal soda, in a gallon of water. Issue soap and water may also be used and if neither soap or soda is available, use plain water. After all powder fouling has been removed, swab the bore with clear water and dry with a piece of burlap or cleaning cloth. SOLVENT, dry-cleaning, may be used with the bore brush to loosen newly formed rust.

(4) After cleaning, coat the bore with a thin protective coating of OIL, engine (seasonal grade), applying it with a slush brush. Under no circumstances should the gun be allowed to set without cleaning after it has been fired.

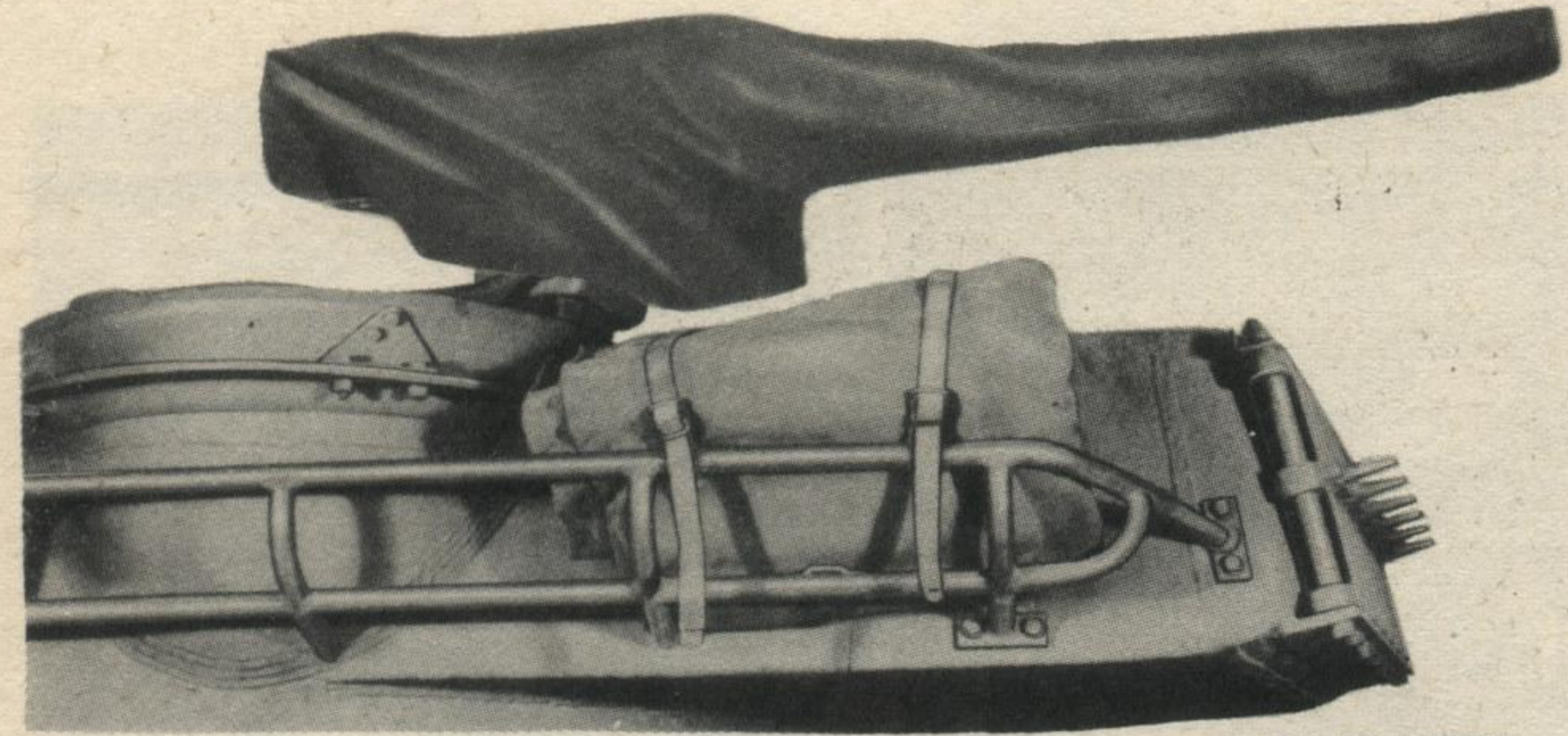
b. Care of Operating Mechanism.

(1) All moving parts of the breech mechanism housed within the breech ring should be disassembled and cleaned at regular intervals or after firing with SOLVENT, dry-cleaning, and lubricated.

(2) If the gun is to be out of service for a considerable length of time all parts should be protected with OIL, engine, SAE 50. When the gun is to be fired, this should be removed and the gun lubricated in accordance with the lubrication chart.

43. CARE OF 76-MM GUN MOUNT T1.

a. The gun mount can be kept in serviceable condition only if constant attention is given to cleaning, lubricating, and adjusting the assemblies.



RA PD 67374

Figure 49 — Cal. .50 Machine Gun M2, Cover Installed

b. Bearing surfaces, revolving parts, springs, screw threads, gear teeth, and exterior parts must be clean and free from dirt.

44. CARE OF CAL. .50 A.A. MACHINE GUN AND MOUNT.

a. Cleaning Bore.

(1) Disassemble groups from gun.

(2) Place barrel, muzzle down, in a vessel containing hot water and issue soap, a soda ash solution, or, lacking these, hot water alone.

(3) Insert cleaning rod with a flannel patch assembled in the breech. Move rod forward and back for about one minute, pumping water in and out of bore.

(4) Use a brass or bronze wire brush while the bore is wet, running it forward and back through the barrel using a full stroke three or four times.

(5) Pump water through bore again to clean.

(6) Dry the cleaning rod and remove barrel from water. Using dry, clean flannel patches, thoroughly swab bore until it is perfectly dry and clean. Thoroughly dry and clean the chamber, using a flannel patch on a stick if necessary.

(7) Saturate a patch with OIL, lubricating, preservative, light, and swab bore and chamber with the patch. Allow a thin coat of the oil to remain in the bore.

(8) The gun should be cleaned not later than the evening of the day on which it is fired, preferably immediately after cessation of firing.

(9) Inspect and clean the gun every day for three days following cessation of firing.

b. Cleaning Gun Parts Other Than Bore.

(1) Wipe receiver clean, care being taken to remove dirt from belt holding pawl. Thoroughly clean cover, bolt, barrel extension, oil buffer, and back plate, using a small stick covered with a flannel patch to remove dirt from all recesses.

(2) Wipe all parts with an oily cloth.

c. Additional information on this weapon will be found in FM 23-60 and FM 23-65.

d. Care of Ring Mount.

(1) The cal. .50 gun mount should be kept clean of dust, dirt and excess lubricant. All screws and nuts should be properly tightened.

(2) Lubricate the ring bearings periodically with OIL, engine (seasonal grade), by means of the oil cup.

45. SPARE PARTS AND ACCESSORIES.

a. Gun spare parts which are provided for replacement by the using arm, must be kept clean, dry and lightly oiled to prevent rust. Stow the parts in the proper equipment box until needed or until periodic inspection.

b. Accessories must be stored covered in brackets and receptacles as provided. Keep accessories clean, oiled, painted or repaired, according to their nature and condition.

46. RECOIL CYLINDERS.

a. When firing the gun observe the action of the recoil cylinders and if improper functioning is noted, take whatever corrective steps conditions will permit.

b. Make sure the recoil cylinder securing nuts are kept tight and securely locked. The piston rod coupling nuts should also be kept tight.

c. Improper functioning is usually the result of too high or too low an oil level within the cylinders or the use of other than specified recoil oil.

d. To check and bring recoil oil to proper level, first depress the gun 9 degrees and remove the recoil cylinder plugs at the rear ends of the cylinders. These plugs should be at the top of the cylinders. Fill cylinders with oil, pouring it through a screen until level reaches bottom of hole.

e. Care must be taken to use only the prescribed recoil oil. Low pour point OIL, recoil, heavy (U. S. A. Specification 2-96A) will be used for prevailing temperatures above 0 F. For prevailing temperatures not exceeding +32 F, OIL, recoil, special, will be used if available. If OIL, recoil, special, is not available, a mixture of 75 percent OIL, recoil, heavy, and 25 percent OIL, recoil, light (U. S. A. Specification 2-36D) will be used.

f. To fill empty recoil cylinders place the gun in a 9 degree depressed position with recoil cylinder plugs at the top. Remove rear recoil cylinder plugs and pour in specified recoil oil until level comes up to bottom of filling holes. Tap cylinders with a block of wood to drive out any air bubbles that may be in the cylinders. Replace rear plugs.

CARE AND PRESERVATION

47. RECOIL OIL.

a. Water must not be introduced into recoil mechanisms that use oil. Exposure of recoil oil in an open can may result in accumulation of moisture. Condensation in a container partly filled with oil, or pouring from one container to another which has moisture on its inner walls, results in moisture being carried along with the oil into the recoil mechanisms.

b. The transfer of recoil oil to a container not marked with the name of the oil may result in getting the wrong oil into recoil mechanisms, or in the use of recoil oil for lubricating purposes. Recoil oil must not be put into any container not properly marked.

c. The following should also be observed: Recoil oils should not be left in open containers or subjected to excessive heat. The greatest care must be taken to exclude moisture and dirt. Strain recoil oil through a clean cloth or fine screen before pouring into recoil cylinders. Do not mix recoil oil with any other type.

48. LUBRICATION.

a. General.

(1) Excessive wear can be prevented by keeping the materiel clean and properly lubricated. Particular attention should be given to the sliding surfaces of the gun breech mechanism.

(2) Lubricants as shown in the lubrication guide (fig. 50) must be used as prescribed. Do not use other than prescribed lubricants.

(3) Lubricating fittings will be painted red for ease in locating and oilholes are encircled by a red ring.

(4) The oil gun should be worked slowly and the parts should be operated to insure proper distribution of the lubricant.

(5) Should a lubrication fitting become plugged and prevent passage of oil, it may be cleaned by using a piece of wire.

(6) Care must be taken when cleaning lubricated surfaces or oil passageways to remove all residue or sediment.

(7) For additional information on lubricants and their use see TM 9-850.

b. Lubrication Guide.

(1) For lubrication of individual units and parts see figures 50 and 51.

(2) Lubrication of the cal. .50 A.A. Gun M2 will be done in accordance with instructions contained in FM 23-60 and FM 23-65.

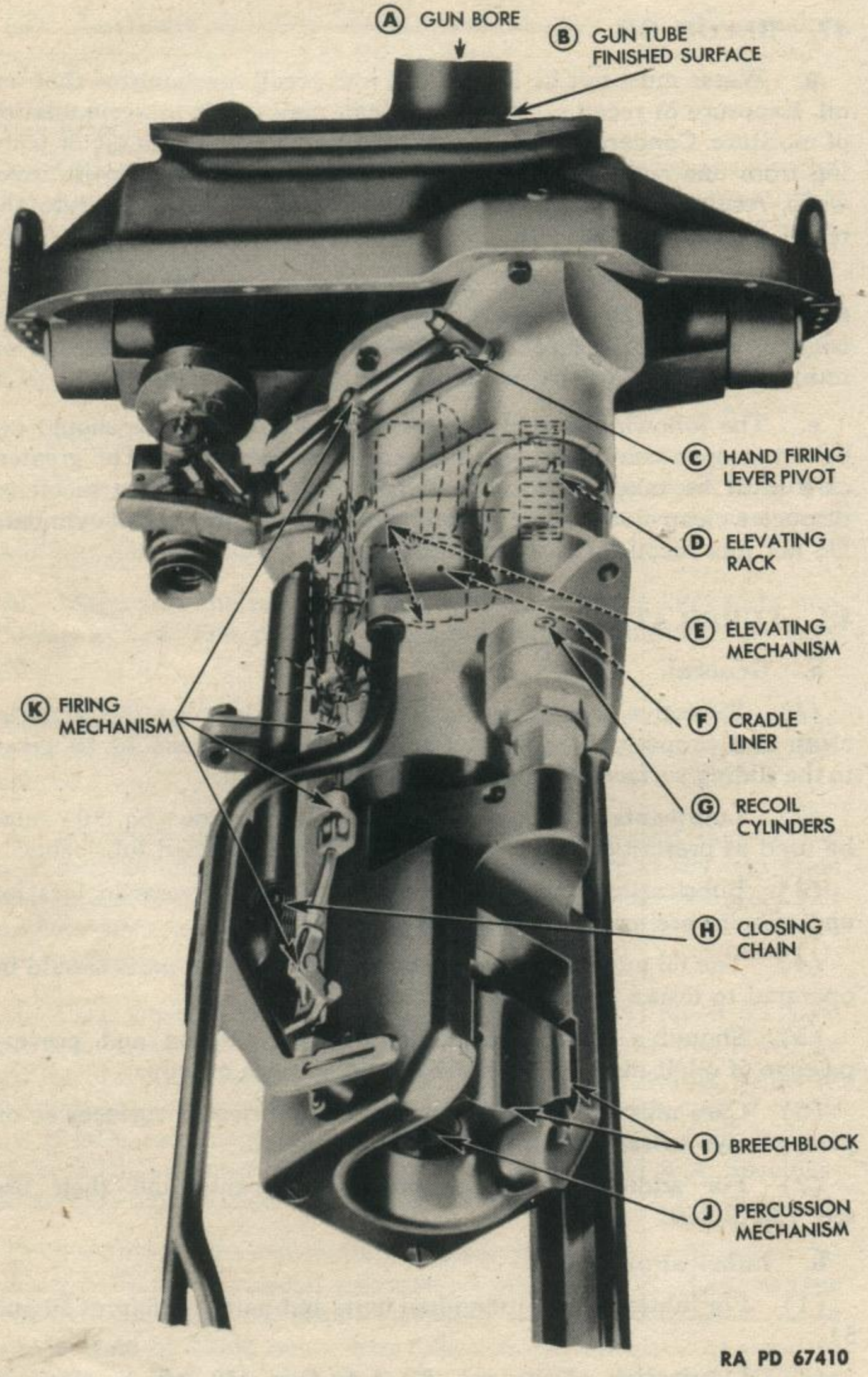


Figure 50 — Lubrication Chart

CARE AND PRESERVATION

LUBRICATION GUIDE

Lubrication Point	Lubricant	Interval and Notes
(A) GUN BORE	Oil, engine, SAE 30 (above + 32°) SAE 10 (below + 32°)	DAILY AND AFTER FIRING Clean and coat with specified oil after firing. Inspect daily and oil if necessary.
(B) GUN TUBE—(Finished Surface)	Oil, engine, SAE 30 (above + 32°) SAE 10 (below + 32°)	DAILY AND BEFORE FIRING Clean and oil exposed finished surfaces—keep surfaces covered with a thin film of oil.
(C) HAND FIRING LEVER	Grease, OD, No. 0 (above + 32°) No. 00 (below + 32°)	WEEKLY Clean fitting before applying lubricant. Lubricate until new grease is forced from the bearing.
(D) ELEVATING RACK	Oil, engine, SAE 30 (above + 32°) SAE 10 (below + 32°)	DAILY Clean and dry gear teeth before applying lubricant. Cover surfaces with thin film.
(E) ELEVATING MECHANISM	Grease, OD, No. 0 (above + 32°) No. 00 (below + 32°)	MONTHLY Clean fittings before applying lubricant. To be lubricated by Ordnance Maintenance Personnel at time of Ordnance Inspection. Lubricant changed seasonally according to temperature.
(F) CRADLE LINER	Grease, OD, No. 0 (above + 32°) No. 00 (below + 32°)	MONTHLY Clean fitting before applying lubricant. Lubricate until new grease is forced from bearing.
(G) RECOIL CYLINDERS	Oil, recoil, low pour point, heavy	BEFORE FIRING Depress gun 9° and bring oil level up to bottom of top rear filler plug hole. Use only specified oil, strained thru fine mesh screen while filling.
(H) CLOSING CHAIN	Grease, OD, No. 0 (above + 32°) No. 00 (below + 32°)	WEEKLY Clean and dry before applying new lubricant. Apply evenly.
(I) BREECHBLOCK	Oil, engine, SAE 30 (above + 32°) SAE 10 (below + 32°)	DAILY AND BEFORE AND AFTER FIRING Clean and oil all moving parts and exposed surfaces. Apply thin film.
(J) PERCUSSION MECHANISM	Oil, engine, SAE 30 (above + 32°) SAE 10 (below + 32°) (In extreme cold weather use Oil, lubricating for aircraft instruments and machine guns)	DAILY AND BEFORE AND AFTER FIRING Remove from gun and clean with SOLVENT, dry-cleaning, before lubricating. Operate firing pin in solvent to clean.
(K) FIRING MECHANISM	Oil, engine, SAE 30 (above + 32°) SAE 10 (below + 32°)	DAILY Clean with solvent, drycleaning before lubricating. Operate mechanism to distribute oil film evenly.

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Figure 51 — Legend for Lubrication Chart

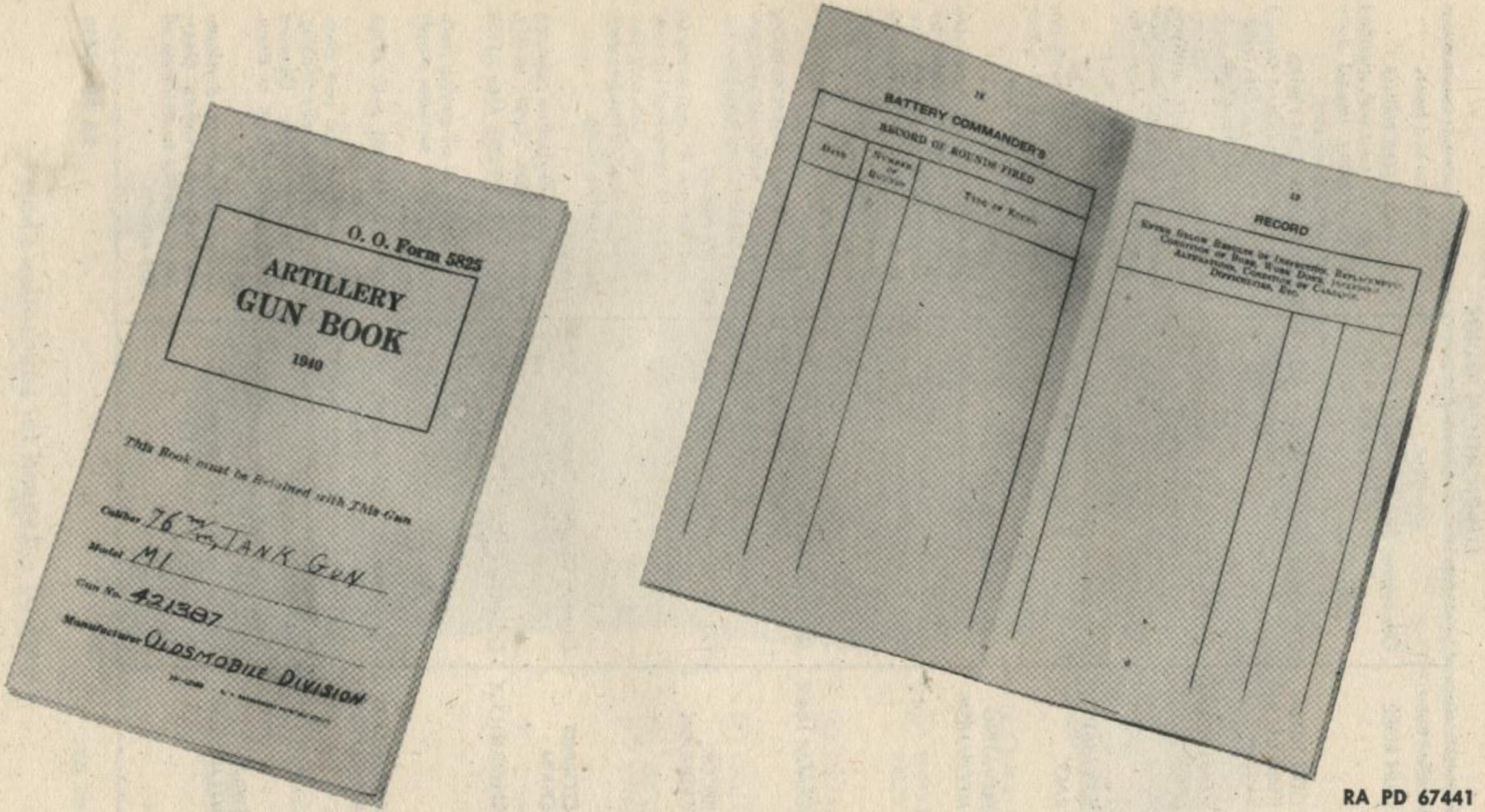

Figure 52 — Artillery Gun Book

c. Points To Be Lubricated By Ordnance Maintenance Personnel.

(1) 76-MM GUN ELEVATING MECHANISM ASSEMBLY. Lubricate this unit with GREASE, O.D., No. 00, where continued temperatures below + 32 F are expected and GREASE, O.D., No. 0, where temperatures above +32 F prevail. This may necessitate a change of lubricant twice yearly which entails partial disassembly as the old lubricant must be thoroughly removed. It is impossible to dilute the lubricant to the point where it can be drained out. New lubricant should be applied when the cover plate is removed. Apply grease through the lubrication fittings but do not overfill.

49. REPORTS AND RECORDS.

a. Reports. If lubrication instructions are closely followed and proper lubricants used, yet results are not satisfactory, report to ordnance personnel.

b. Records. A complete record of all inspection, lubrication and maintenance will be kept for the materiel in the Artillery Gun Book, O.O. Form 5825 (fig. 52). Instructions for the use of this book are outlined in its introductory pages. See also OFSB 4-1.

50. CLEANING AND PRESERVING MATERIALS.

a. The following cleaners, abrasives and preservatives are required for use with this materiel (see TM 9-850 for detailed information):

(1) CLEANERS AND ABRASIVES.

ALCOHOL, ethyl, grade 1
AMMONIA, 28%
AMMONIUM CARBONATE
AMMONIUM PERSULPHATE
BURLAP, jute (8 oz., 40 in. wide, yd)
CLOTH, crocus
CLOTH, abrasive, aluminum-oxide, No. 00
CLOTH, abrasive, aluminum-oxide, No. 0
CLOTH, abrasive, aluminum-oxide, No. 1
CLOTH, wiping, cotton, mixed (type II), sterilized (for) machinery, class A
PAPER, flint, class B No. ½
PAPER, flint, class B No. 1
PAPER, flint, class B No. 2
PAPER, lens, tissue
PATCHES, cut (canton flannel)
POLISH, metal, (type III) paste
REMOVER, paint and varnish
SOAP, castile
SOAP, saddle
SODA ASH
SODA, caustic (lye)
SOLVENT, dry-cleaning
SPONGE, natural, type
WASTE, cotton, colored
WASTE, cotton, white

(2) LUBRICATING AND PRESERVING MATERIALS.

COMPOUND, rust-preventive, light
COMPOUND, rust-preventive, thin film
GREASE, graphite, medium
GREASE, graphite, soft (aircraft)
NAPTHALENE, flake
OIL, engine, SAE 10
OIL, engine, SAE 30
OIL, linseed, raw, type A
OIL, lubricating, car and locomotive engine
OIL, lubricating, chain and wire rope, grade 2
OIL, lubricating, for aircraft instruments and machine guns
OIL, neat's-foot
OIL, neutral
PETROLATUM

b. Recoil Fluid.

OIL, recoil, heavy
OIL, recoil, light
OIL, recoil, special

51. PAINTS AND RELATED MATERIALS.

a. The following paints and related materials are required for use with this materiel. See TM 9-850 for detailed information.

ENAMEL, synthetic, gloss-black
ENAMEL, synthetic, gloss-red
ENAMEL, synthetic, blue-drab, lusterless
ENAMEL, synthetic, olive-drab, lusterless
ENAMEL, white
LACQUER
LEAD, red, dry, grade B
MIXTURE, liquid, for red lead paint
PAINT, iron-oxide, ready-mixed
PAINT, stencil, blue-drab
PRIMER, synthetic, refinishing
PRIMER, synthetic, rust-inhibitive
THINNER synthetic enamels
TURPENTINE, gum spirits
VARNISH, shellac, orange, high iodine, medium
VARNISH, spar, water-resisting

52. PRESERVATION OF THE MATERIEL IN STORAGE.

a. If the materiel is to be stored, all unpainted surfaces must be treated with rust preventive. First clean the surfaces with SOLVENT, dry-cleaning, dry thoroughly and apply rust preventive.

b. Brush or slush the interior surfaces such as the bore of the gun and moving parts of the breech mechanism with COMPOUND, rust-preventive, light.

c. Spray or brush exterior surfaces with COMPOUND, rust-preventive, thin film.

Section VII

INSPECTION AND ADJUSTMENT

	Paragraph
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General	54
76-mm gun M1	55
76-mm gun mount T1	56
Cal. .50 A.A. gun and mount	57
Sighting equipment	58
Armament spare parts and accessories	59

53. PURPOSE.

a. Inspection is for the purpose of determining the condition of the materiel, whether repairs or adjustments are required, and the corrections necessary to insure serviceability and proper functioning. Thorough systematic inspection at regular intervals is the best insurance against an unexpected gun breakdown at a critical moment when maximum performance is absolutely necessary.

54. GENERAL.

a. Inspection of the materiel should be carried on at all times that it is being handled, either under actual firing conditions or during cleaning and lubrication procedures. Each time the materiel is to be used, the operators should carefully observe all of the mechanisms, together with the levers and handles which are necessary for their operation. If mechanisms gradually become more difficult to operate, thereby showing signs of a gradual wear or deformation of parts, a critical inspection and possible disassembly should be made as soon as it is practicable to do so. When firing, the action and behavior of the materiel should be noted. Special attention should be directed toward the 76-mm gun recoil cylinders. When disassembling, for the purpose of cleaning and lubrication, each and every part should be checked for burs, rough surfaces, or any other signs of wear that will disturb the true motion of the mechanisms. These deformations should be removed immediately by using a fine abrasive. After lubrication and cleaning, these parts should be checked for their proper action.

b. Proper coordination of cleaning, lubrication, inspection, correction, and operating procedures will keep the materiel in good working condition at all times.

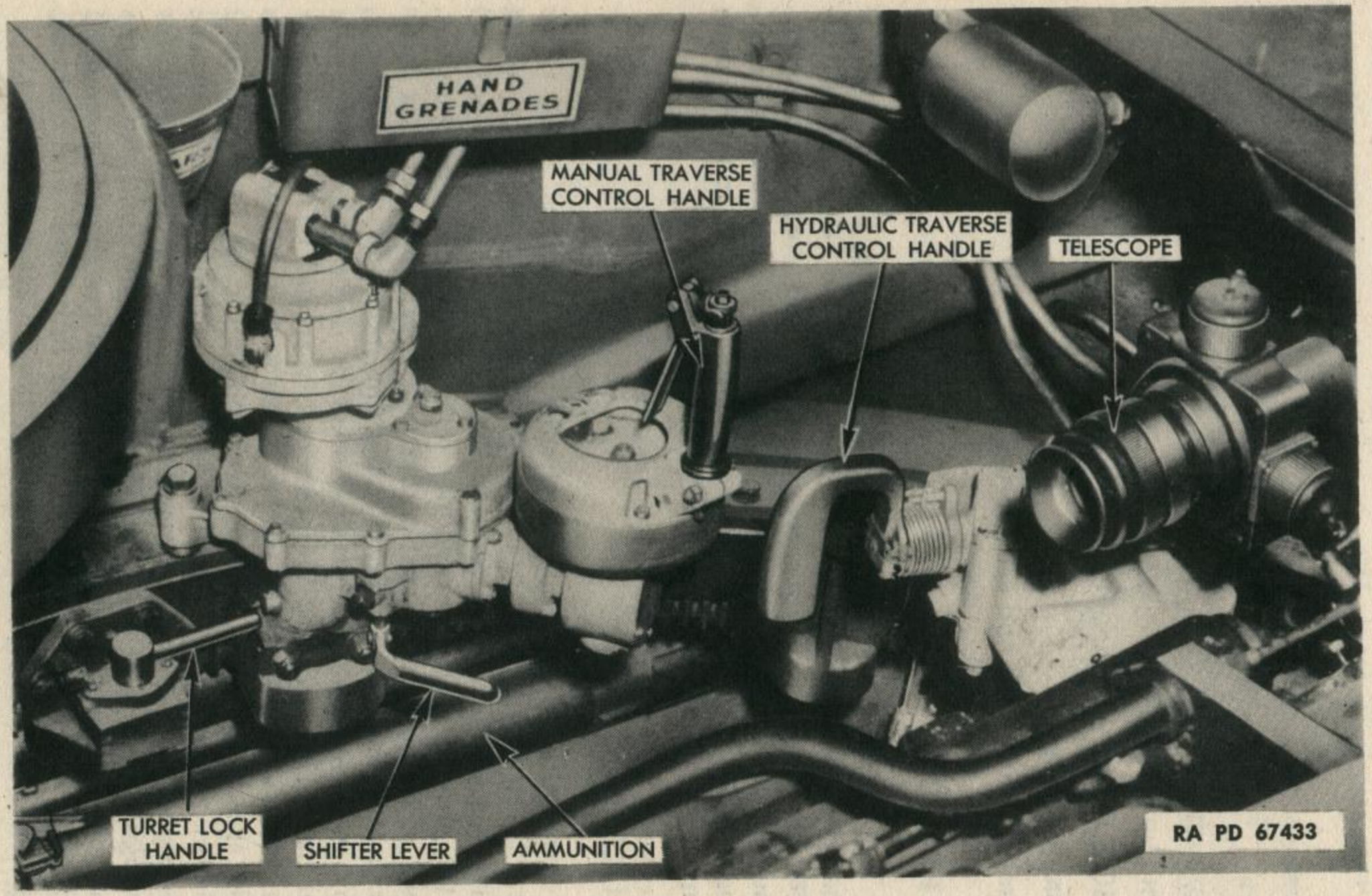


Figure 53 — Turret Controls

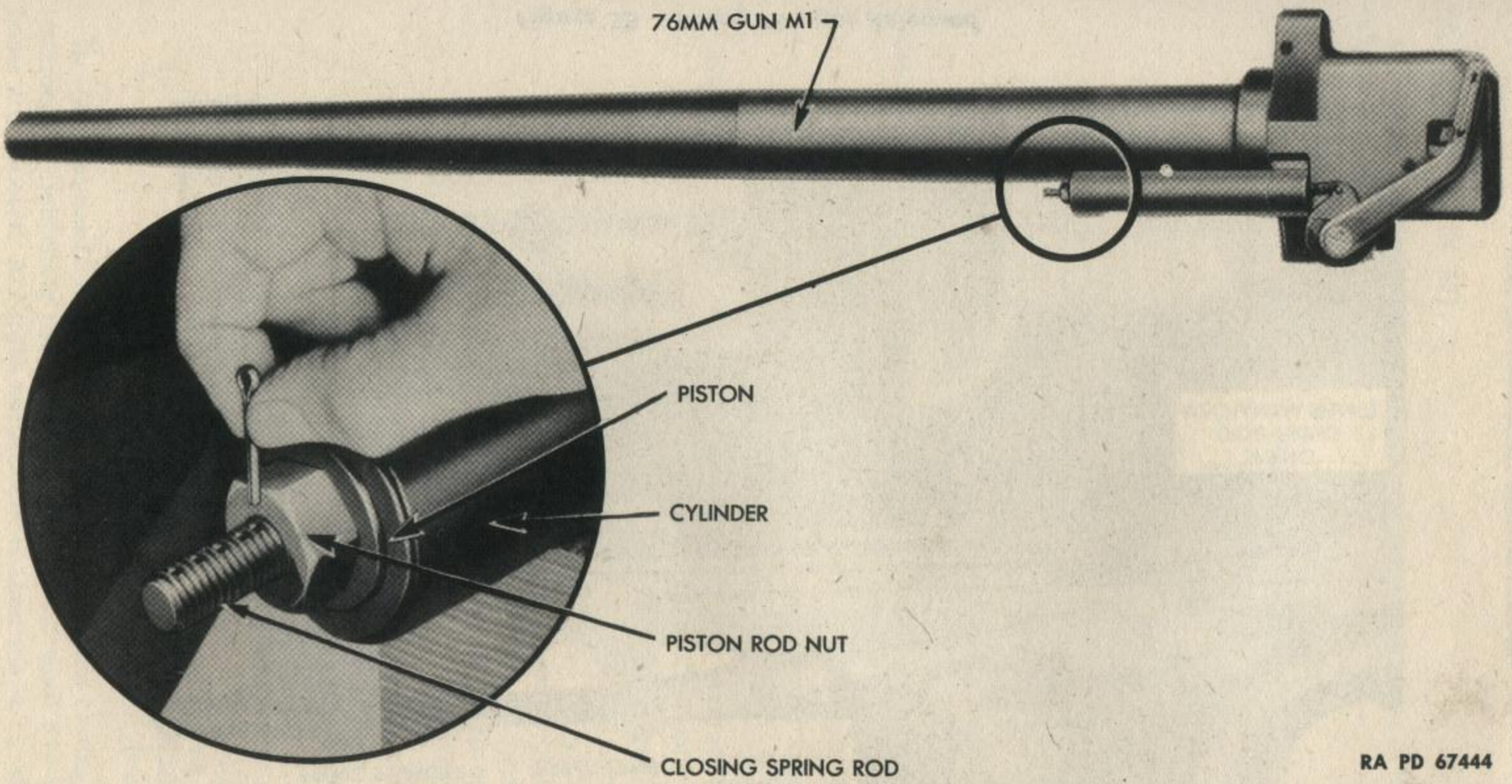


Figure 54 — 76-mm Gun M1, Closing Spring Adjustment

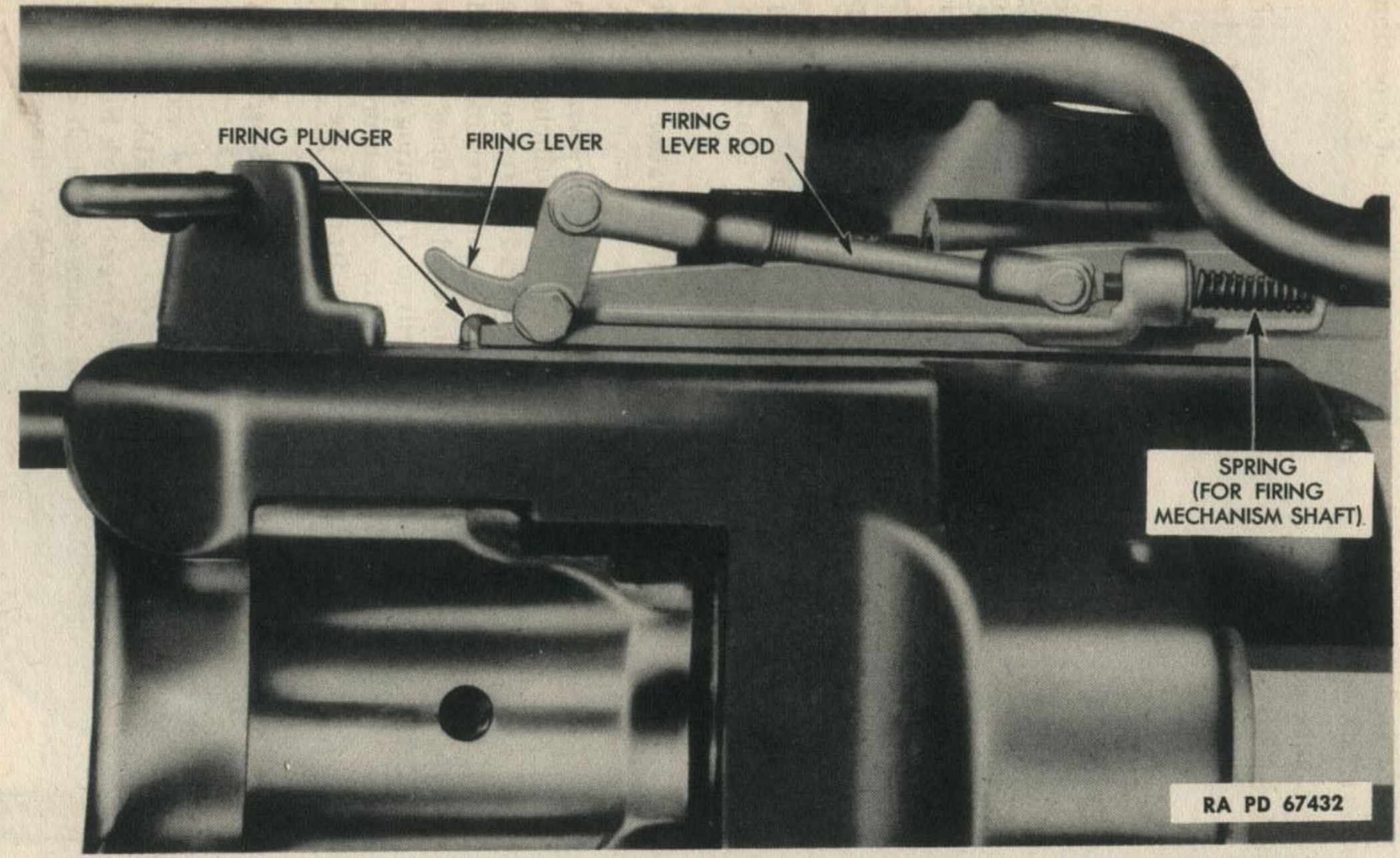


Figure 55 — Firing Plunger Released

INSPECTION AND ADJUSTMENT

55. 76-MM GUN M1.

a. The following instructions outline the proper order of inspection to be followed:

Parts To Be Inspected	Points To Observe
The gun as a unit.	Note the general appearance and smoothness of operation of the breech mechanism.
	Check closing spring mechanism.
	Note condition of bore for copper deposit on the lands and in the grooves and erosion at origin of rifling.
	Examine bearing surface of exterior of tube for scoring or mutilation.
Breech ring.	Remove breechblock crank group and breechblock assembly.
	Note whether there are scores or burs on any of the bearing surfaces.
Breechblock.	Check for proper operation of sear and cocking mechanism.
	Measure firing pin protrusion which should be $\frac{5}{32}$ to $\frac{7}{32}$ inches. This can be measured by removing the firing spring and retainer and pressing forward on firing pin as far as it will go. The firing pin protrusion can then be measured with a scale at the front of the breechblock.
	Make visual inspection of percussion mechanism.
	Note whether there are scores or burs on the breechblock and whether breechblock bushing screw is secure and flush with or below front face of breechblock.

b. Adjustment. Approximate adjustment of the closing spring is obtained by tightening the spring piston rod nut until five cotter pin holes are exposed. Accurate adjustment is then made by trial. Open

the breech. Trip the extractors with an empty cartridge case or suitable block of wood. If the breechblock does not fully close or action is sluggish, tighten the nut, one cotter pin hole at a time, until the proper adjustment is reached. If the breechblock closes too fast, loosen the nut, one cotter pin hole at a time, until correct adjustment is obtained (fig. 54).

56. 76-MM GUN MOUNT T1.

a. Inspect mount as follows:

Parts To Be Inspected	Points To Observe
Mount as a unit.	Note the general appearance and color and smoothness of operation of all moving parts and bearings.
	Check for cause of any oil or lubricant leakage at flange packings and gaskets.
	Check for ease and smoothness of operation of the elevating mechanism.
	Check all mount shields for cracks, burs and other damage.
Cradle.	Check cradle liners for oil leakage at seal.
	Check ejector cam and spring.
	Check cradle brackets for cracks, burs and bent conditions.
Elevating mechanism.	Check packing flanges for burs or other causes of oil leaks.
	Check for excessive backlash. Maximum allowable rotation of handwheel with gun in fixed position shall not be more than ¾ inch measured at rim of handwheel. Maximum backlash between pinion gear and elevating rack shall not be more than 0.003 inch. (For adjustment, see par. 76 e.)
	Check for correct lubrication. See lubrication chart (fig. 50).
Traversing mechanism.	Refer to turret traversing system instructions as found in paragraph 33.

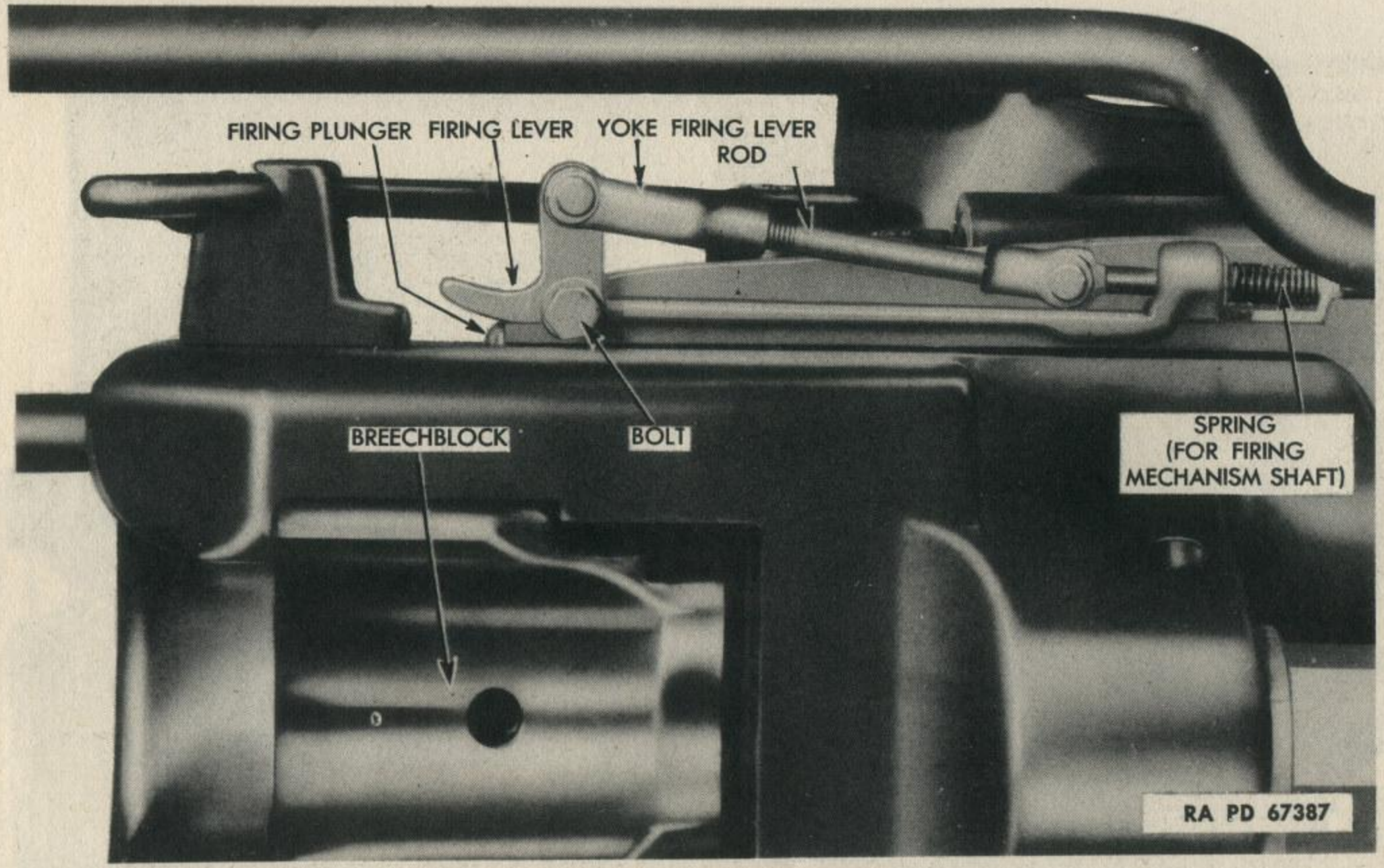


Figure 56 — Firing Plunger Depressed

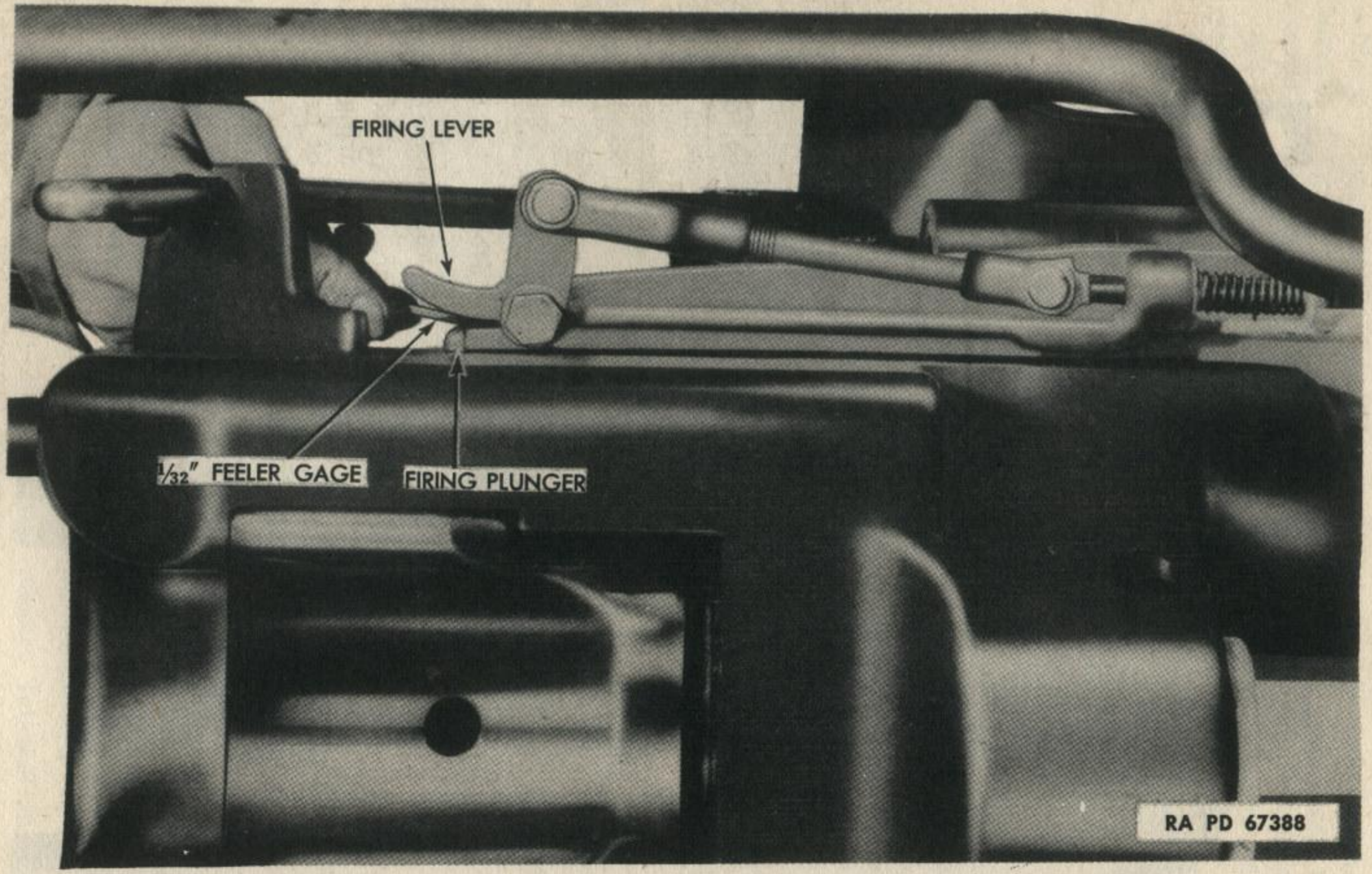


Figure 57 — Checking Firing Plunger Clearance

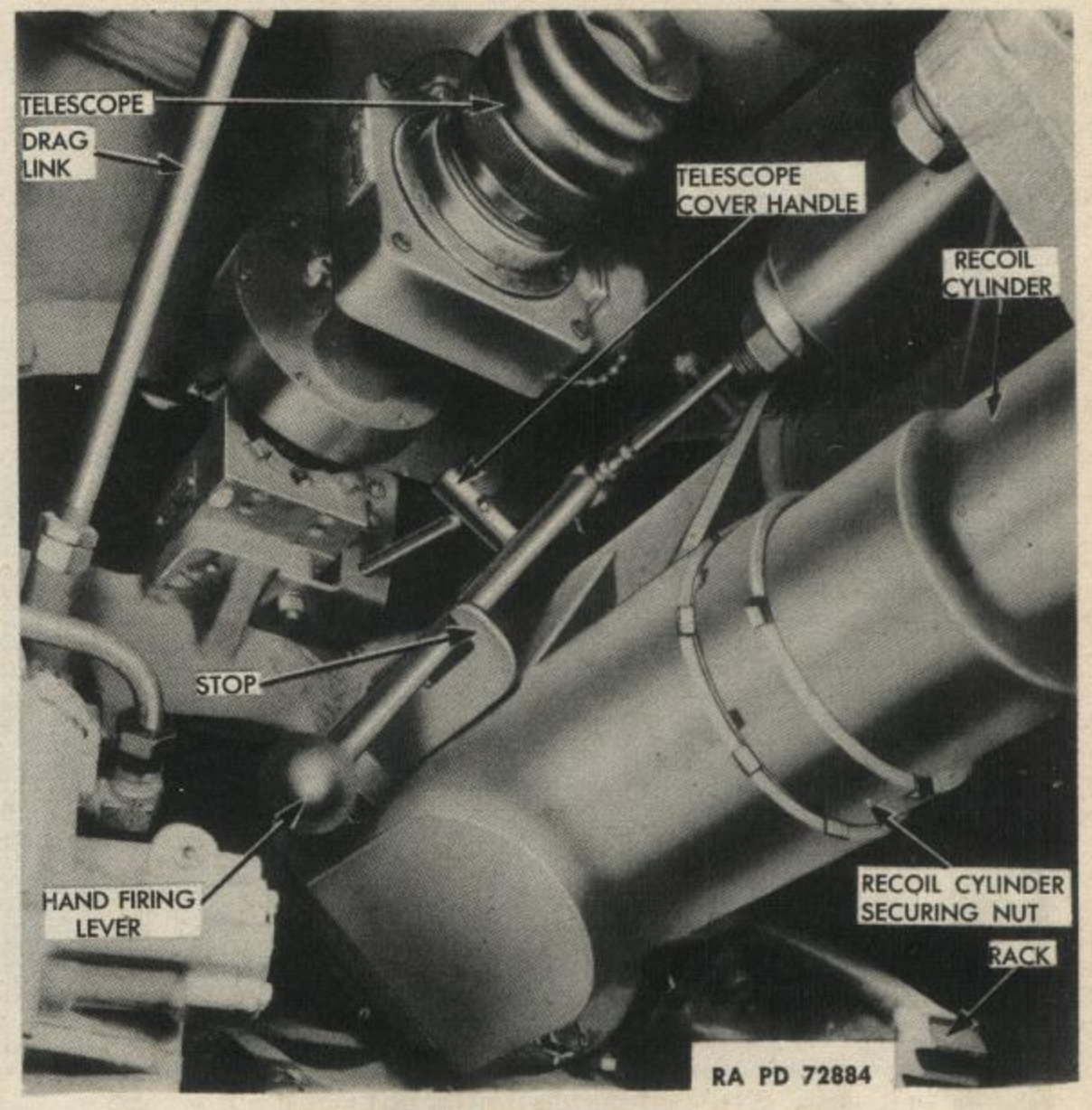


Figure 58 — Hand Firing Lever Stop

Parts To Be Inspected	Points To Observe
Firing mechanism.	Make sure there is $\frac{1}{32}$ of an inch clearance between firing plunger and contact surface of firing lever (subpar. b below).
	Check smoothness and operation of firing mechanism.
Recoil cylinders.	Check for leakage at piston rods, cylinder plugs and covers.
	Make sure piston rod coupling nuts are drawn up tight until flanges of nuts contact breech ring.
	For proper filling of cylinders refer to paragraph 46.
	Check recoil cylinder securing nuts and locking washers.

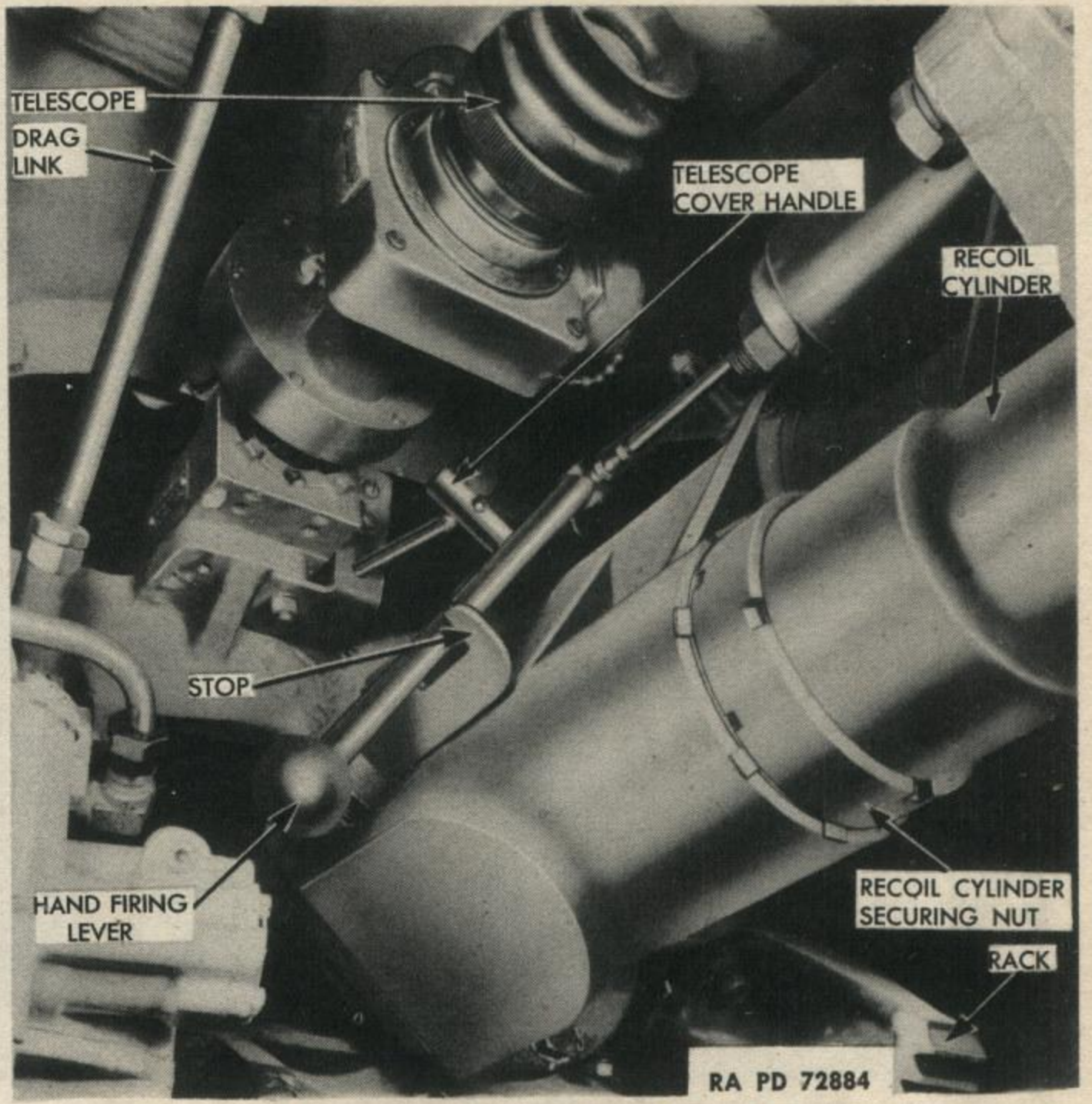


Figure 58 — Hand Firing Lever Stop

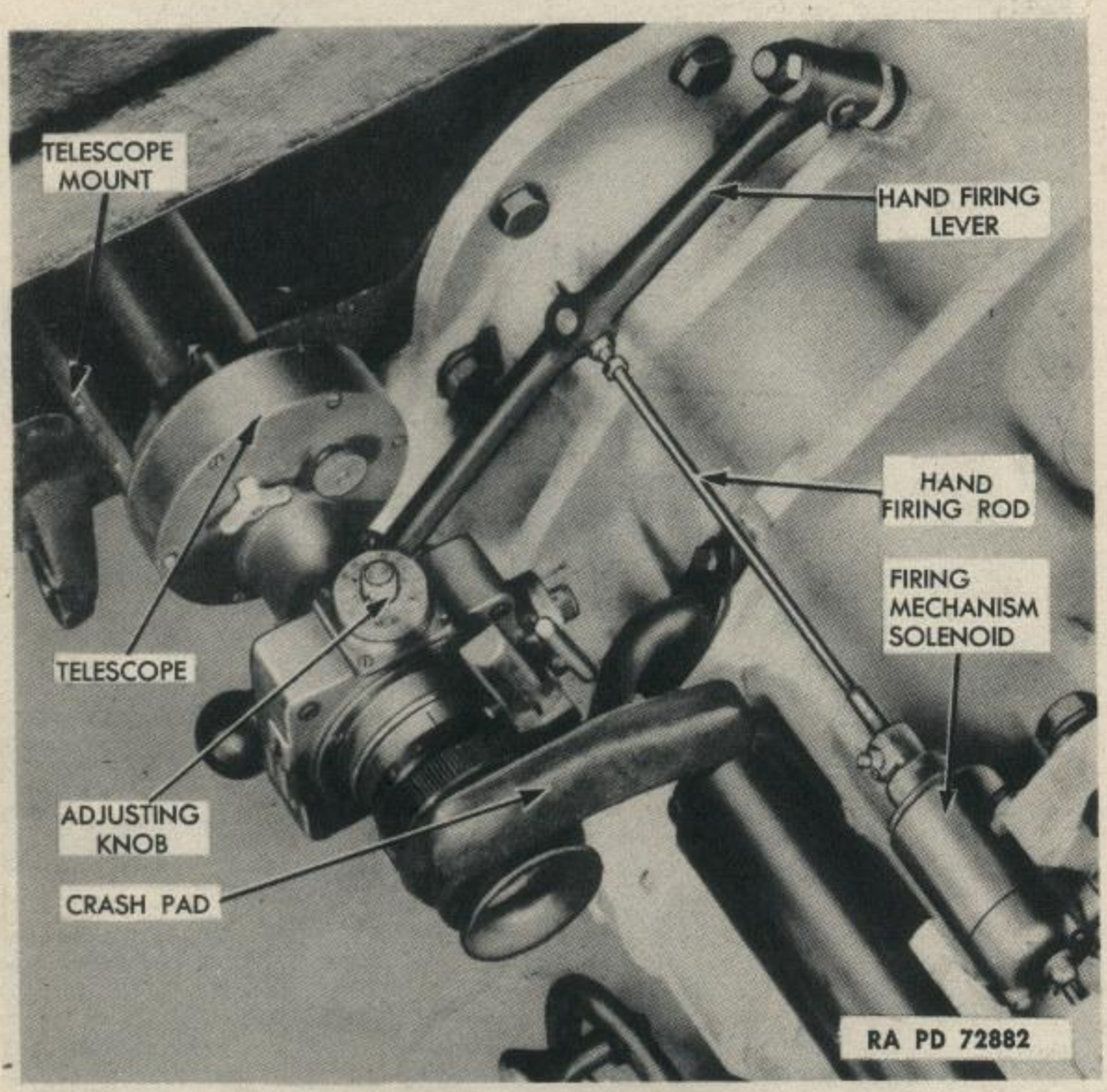


Figure 59 — Hand Firing Lever and Solenoid

b. Adjustment.

(1) Proper clearance of $\frac{1}{32}$ inch between firing plunger and contacting surface of firing lever may be obtained by changing over-all length of firing lever rod and yoke. Turn threaded rod end yoke on or off to make this adjustment and check with a $\frac{1}{32}$-inch feeler gage (figs. 55, 56 and 57).

NOTE: When making this adjustment, the hand firing lever should be against its forward stop (fig. 58), and care should be taken that the adjusted length of the hand firing rod (fig. 59) does not prevent the solenoid plunger from returning to its seat (full forward position).

(2) With the hand firing lever pulled rearward against the rear stop, adjust the hand firing rod by lengthening it one turn more than is necessary to fire the gun. This adjustment should be made with the gun empty and cocked, and should never be attempted until proper clearance between firing plunger and firing lever has been obtained

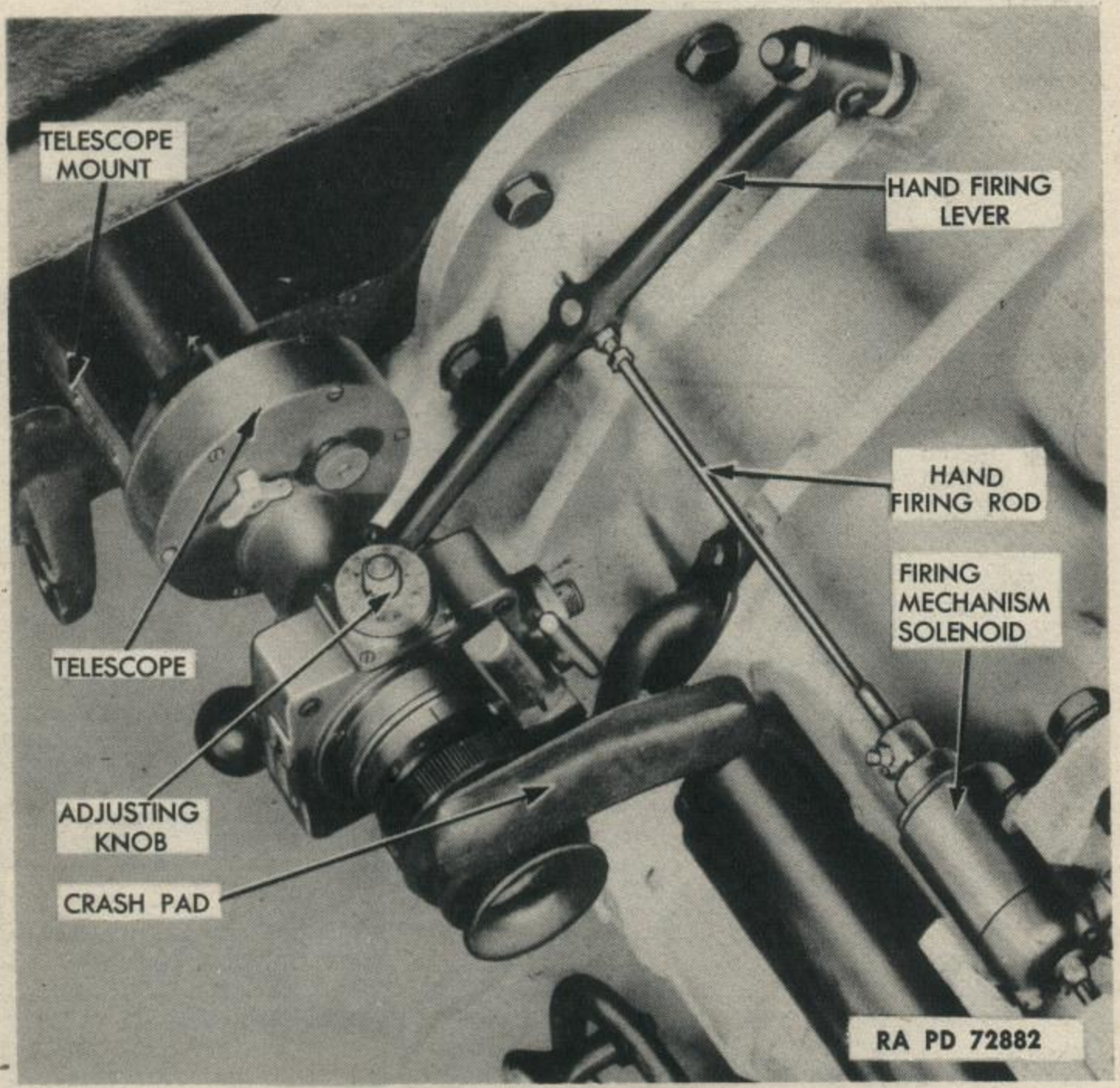


Figure 59 — Hand Firing Lever and Solenoid

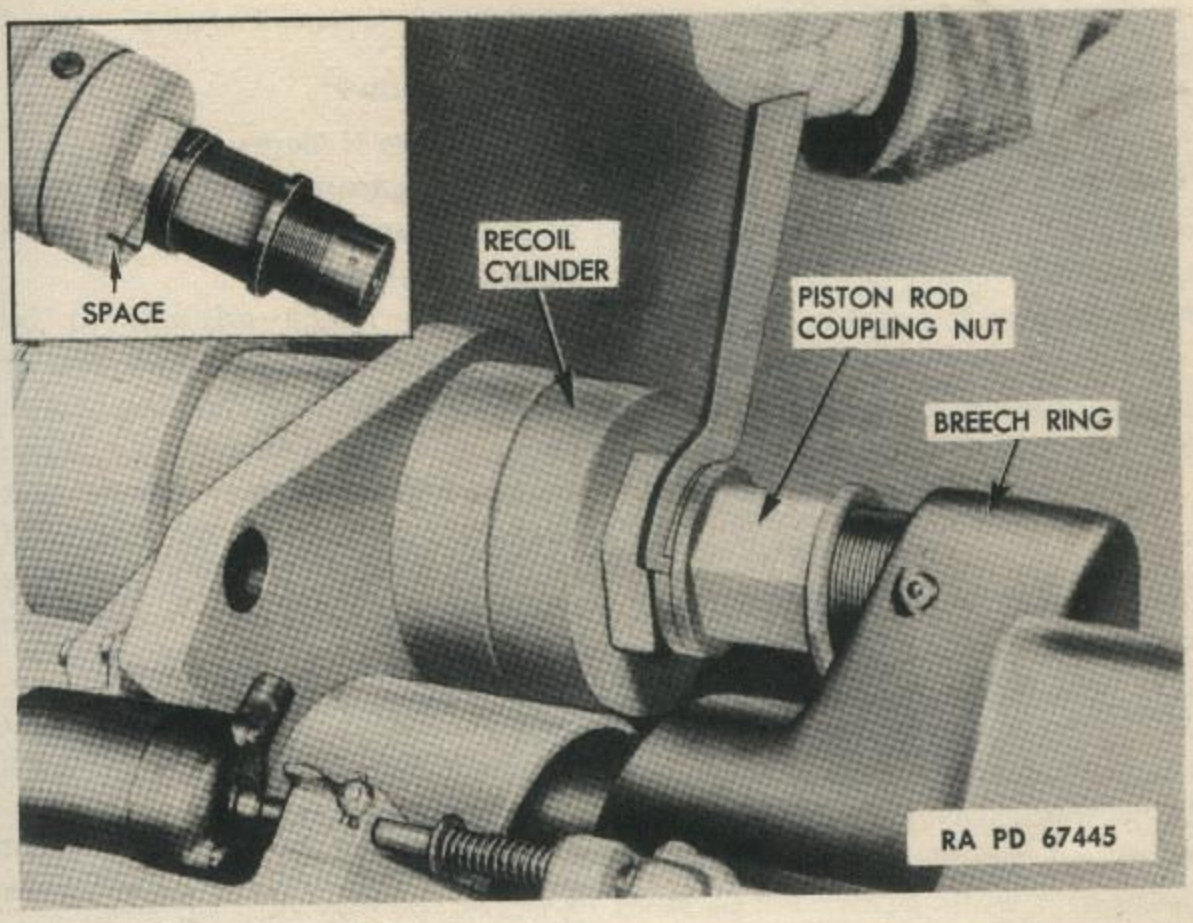


Figure 60 — Adjusting Recoil Piston Rod Bushing Follower

as described in the preceding paragraph. To adjust the hand lever rod, first shorten it several turns until pulling the hand lever against the rear stop will not fire the gun. Holding the hand firing lever firmly against the rear stop, lengthen the rod until the click of the firing pin is heard; continue lengthening the rod one full turn.

NOTE: Make certain the hand firing lever pivots freely on its pin and that its retracting spring returns and holds the hand firing lever against its forward stop (fig. 58).

(3) Adjust the periscope drag link so that the elevating motion of the gun is transferred as an equal motion to the periscope holder. The correct length is approximately 10⅛ inches (fig. 31). For verification of the adjustment, see paragraph 86 **b** (1).

(4) Adjust recoil cylinder piston rod bushing follower by tightening follower with spanner wrench sufficiently to compress packing and thereby stop excessive leakage around piston rod (fig. 60). There normally will be approximately $\frac{1}{16}$ inch clearance between front face of follower flange and rear face of cylinder cover (fig. 60). This clearance allows follower to be tightened to compensate for normal wear of packing.

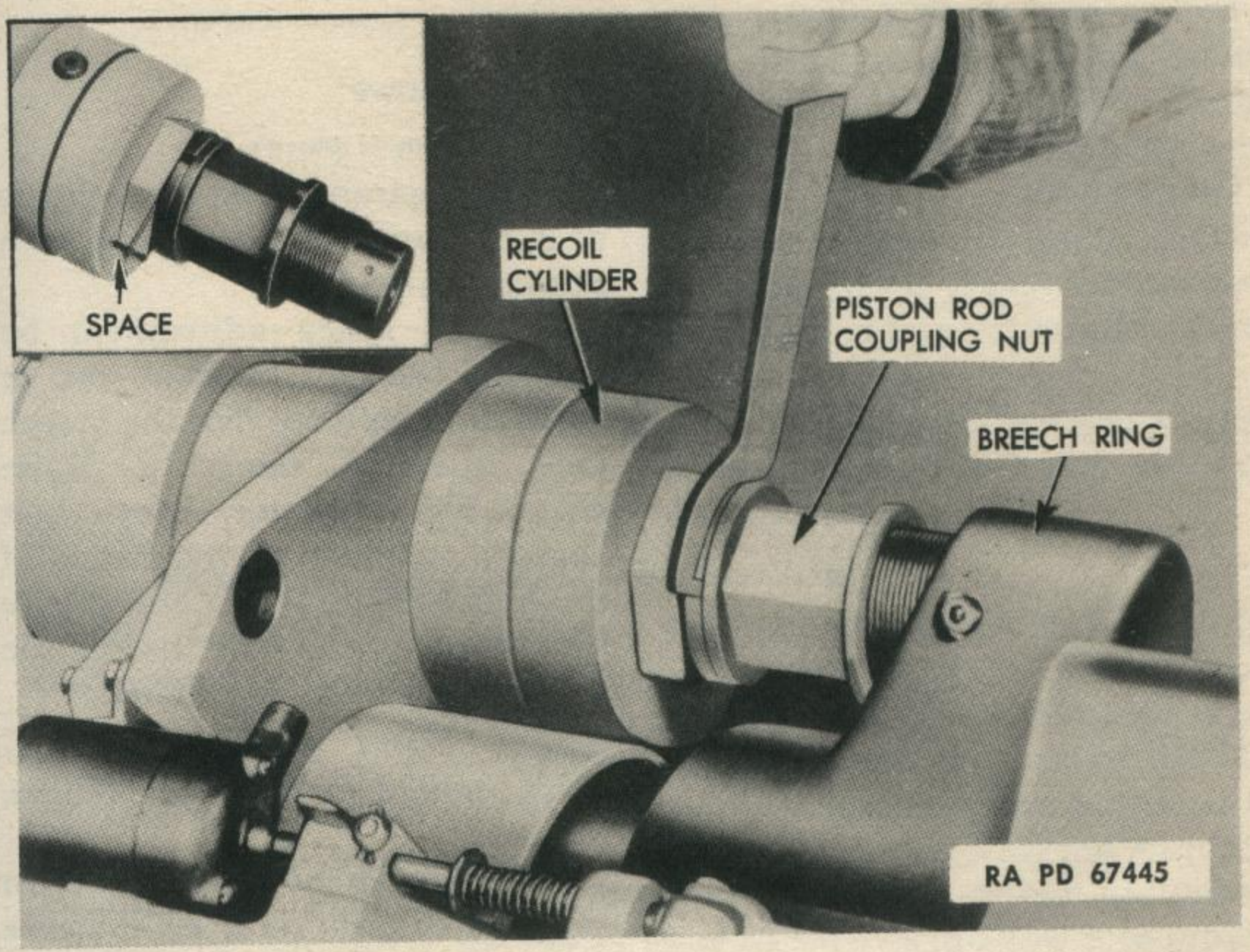


Figure 60 — Adjusting Recoil Piston Rod Bushing Follower

57. CAL. .50 A.A. GUN AND MOUNT.

a. Inspect cal. .50 gun and mount as follows:

Parts To Be Inspected	Points To Observe
Gun as a unit.	General appearance and smoothness of operation; test functioning with dummy cartridges.
	Check head space adjustment by working the bolt by hand two or three times and see that the breech lock operates smoothly. Raise cover and extractor. Move bolt slightly to the rear by means of the bolt handle. If the bolt moves independently of the barrel the adjustment needs tightening.
Barrel.	Visually inspect bore for obstructions, foreign matter, rust, bulges, pits, etc.
	Check sharpness of lands. If worn away for the first six or eight inches the barrel is unserviceable.
	Check chamber for wear or corrosion.
Receiver.	Inspect for burred or worn surfaces and enlarged firing pin hole in bolt.
	Check firing pin for free movement in bolt.
	Inspect sear for worn notch, sear spring for tension, and sear slide for fit.
	Inspect cocking lever for burred or worn nose.
	Check driving spring free length. It should be 22 inches plus or minus one inch.
	Inspect breech lock pin cams for burs.
	Check for proper lubrication of receiver parts.
Gun sights.	Check gun sights.
Mount, cal. .50 A.A. gun.	Check traversing action of ring for freedom and ease of action. Check for proper lubrication of ring bearings. Make certain bearings are free from grit and other foreign matter.

INSPECTION AND ADJUSTMENT

Parts To Be Inspected	Points To Observe
	Check operation of ring mount brake.
	Inspect mount supports for cracks or loosening of attaching bolts and screws.
	Inspect gun support, cradle, torsion balance spring, travel lock assembly, lubrication of cradle pivot pins.
	Inspect ammunition box and storage boxes, spare barrel and cleaning equipment.

b. Headspace Adjustment and Checking.

(1) GENERAL. The headspace of a machine gun, with a cartridge fully seated in the chamber, is herein considered as the distance from the base of the cartridge to the face of the bolt. The headspace is adjusted by obtaining the proper distance between the face of the bolt and the breech end of the barrel. *The headspace adjustment must be checked before firing. Headspace must be adjusted with the gun fully assembled.* In order to make a true headspace adjustment, the dimensions of the rear end of the barrel must be such as to allow it to project slightly through the barrel extension when screwed in all the way. The barrel must be free from burs.

(2) ADJUSTMENT.

(a) Retract the action (recoiling parts) of the gun about one inch and allow it to go forward into battery. It should just close without being forced. (When "in battery," the barrel extension should bear upon the trunnion block with the bolt fully locked.)

(b) If the action does not completely close, screw the barrel out of the barrel extension, one notch at a time, until it will just close without being forced. This may be accomplished by turning the barrel by means of the handle of the barrel carrier.

(c) If the action snaps freely into battery, screw the barrel into the barrel extension, one notch at a time, until it will just close without being forced.

(d) Then unscrew the barrel two notches.

NOTE: To screw the barrel into or out of the barrel extension, engage the serrations at the breech end of the barrel with a screwdriver or the point of a cartridge. The bolt may be hung by engaging the extractor with the bolt stop projecting from the left-hand side plate, while adjusting the barrel. For convenience in adjusting the barrel, the right-hand cartridge stop assembly (if assembled) may be removed. (The barrel may be turned by means of the barrel carrier, if assembled.)

CAUTION: After headspace is properly adjusted and checked, the head of the bolt of the barrel carrier assembly must be disengaged from the notch in the barrel and the carrier turned freely until the handle points *directly down,* and the bolt then engaged with the nearest mating notch. Care should be observed not to turn the barrel while so positioning the carrier, or the headspace adjustment will be disturbed. The carrier is disengaged by pulling the bolt forward against spring pressure to disengage the head from the notch in the barrel. This positioning of the carrier is necessary to prevent turning of the barrel during firing due to vibration or by accidental turning of the carrier which would turn the barrel.

(3) CHECKING HEADSPACE ADJUSTMENT BY USE OF HEADSPACE AND TIMING GAGE A196228. This combination gage provides a definite means for checking headspace adjustment. The portion of the gage to be used for checking headspace is marked "HEADSPACE-0.200." The following procedure should be followed in checking headspace:

(a) After headspacing in the manner prescribed above, the barrel will protrude slightly beyond the inner face of the barrel extension.

(b) Cock the firing pin by fully retracting the recoiling parts, and then allowing them to go fully forward into battery.

(c) Retract the bolt slightly (not more than $\frac{1}{16}$ inch) in order to relieve the driving spring pressure between the bolt and the rear end of the barrel, and place the forward face of the breech lock and bolt in close contact as when firing.

(d) Then, insert the gage in the T-slot between the face of the bolt and the rear end of the barrel. (If the gun is headspaced too tightly, it will not be possible to insert the gage. If such is the case, the barrel should be unscrewed, one notch at a time, until the gage will just enter the full depth of the T-slot without being forced.)

CAUTION: Never release the firing pin while the gage is inserted in the T-slot or the pin will be damaged.

(e) If the gun has been headspaced in the prescribed manner, and if the headspace gage will just slide for its full length between the face of the bolt and the end of the barrel without being pushed downward, the headspace is correct. It must be clearly understood that the headspace gage is a "GO" gage which was designed particularly for the purpose of checking guns in installations when tight headspace would cause serious trouble. (If the gage enters *easily,* test for excessive headspace as in step *(f),* below.)

(f) The gage, however, may be used to determine whether headspace is unnecessarily loose by screwing the barrel into the barrel extension, one notch at a time, until the gage will not enter, and then unscrewing the barrel one notch so the gage will enter properly.

CAUTION: Refer to CAUTION in subparagraph **b** (2) *(d),* above.

c. The back plate adjusting screw should be turned in tightly in all cases.

d. Full detailed instructions in disassembling, assembling and adjustment of the cal. .50 machine gun are given in FM 23-60 and FM 23-65.

e. Replace any scored or burred ball bearings in ring mount.

58. SIGHTING EQUIPMENT.

a. Inspection of sighting equipment will cover the following points:

(1) Mechanical condition.

(2) Image quality.

(3) Parallax in telescopes. (Parallax is relative movement between the reticle and a distant target when the observer moves his head from side to side or up and down.)

(4) Telescope adjusting mechanisms of Periscope M4.

(5) Functioning of head locking mechanisms of periscopes.

b. Examine the sighting instrument mounts, tighten cap screws if looseness is detected. Inspect lenses for condition, and for oil and dirt.

c. For further information on sighting equipment refer to section XII.

59. ARMAMENT SPARE PARTS AND ACCESSORIES.

a. Examine for completeness, condition and appearance; also check for proper stowage.

Section VIII

MALFUNCTIONS AND CORRECTIONS

	Paragraph
Stoppages and immediate action	60
Gun malfunctions	61
Mount malfunctions	62
Cal. .50 gun and mount malfunctions	63

60. STOPPAGES AND IMMEDIATE ACTION.

a. General.

(1) A stoppage is unintentional cessation of fire caused by the malfunction of the gun or ammunition. A malfunction is an improper action of some part of the gun, which usually results in a stoppage; for example, failure to fire, or failure to extract.

(2) Immediate action must be taken to correct such stoppage.

(3) Most stoppages can be prevented by careful adherence to the instructions given in sections VI and VII.

(4) Stoppages are generally classified as failure to fire, failure of breech to close, failure of gun to return to battery, and failure to extract. With the 76-mm gun, the most probable type of malfunction will be failure to fire. Those malfunctions which are not the result of broken or worn parts can generally be laid directly to carelessness and improper care of the weapon and the ammunition.

(5) When the gun first fails to fire, the position of the firing shaft release lever should be checked. Due to the location of the firing shaft release lever it is possible to set it on the "SAFE" position by accidentally rotating it. If the lever is in the proper position the failure of the gun to fire may be the result of the gun staying out of battery, failure of the firing mechanism, failure of the breech to close, or defective ammunition.

(6) The gun may be held out of battery by an obstruction between the breech ring and the rear portion of the mount. Check for, and remove any obstruction. An excessive amount of oil in the recoil cylinders will hold the gun out of battery. Elevate the breech nine degrees; carefully unscrew the rear recoil cylinder plug of one recoil cylinder a few turns and push the tube assembly forward by hand. Do not entirely remove the plug as an excessive amount of oil may

be forced from the cylinder by the piston if the gun suddenly starts forward into battery. Allow the oil to drain until it will no longer flow from the cylinder, then tighten the recoil cylinder plug. Repeat the process for the other cylinder. If no oil will drain from the recoil cylinders, the gun may be held out of battery by an accumulation of dirt between the tube bearing and the bronze liner. The dirt may be removed by unscrewing the piston rod coupling nuts from the breech ring, sliding the gun back, and cleaning off the tube bearing. CAUTION: Before unscrewing coupling nuts always make sure gun is in a horizontal position.

(7) If the tube assembly is in battery, recock and attempt to fire; if the gun still fails to fire, remove the round, reload, and attempt to fire again. If the gun does not fire, the stoppage may be found in the firing mechanism. Check it for proper operation. If the firing mechanism operation is sluggish or stuck, check the alinement of the firing lever rod and firing lever. If the firing mechanism functions properly remove the firing pin guide assembly, clean, and replace any damaged or broken parts. If the firing pin guide assembly and firing spring are not damaged, disassemble the entire breech mechanism, clean, and replace any weak or broken parts.

(8) The breech may be held open by a dirty or bulged round. If the round cannot be removed easily, drive the round into the chamber by using a 15- by 2- by 4-inch piece of wood as a drift against the base of the shell and to one side of the primer. An attempt to pull a badly stuck shell from the gun may leave the projectile stuck in the chamber and cause the loader to spill the powder charge inside the tank. A fuzed projectile stuck in the bore must be removed with a special rammer staff by experienced ordnance personnel.

(9) The breech may not close if there is dirt on the surface of the breechblock. Disassemble the block and clean it. The closing spring may not be compressed enough to raise the breechblock to the closed position. Adjust the spring piston rod nut until the breech closes properly. See section VII, paragraph 55.

(10) If the breech mechanism fails to extract the empty case, the cause may usually be traced to broken extractors. However, dirty ammunition or a dirty chamber may cause this condition. Pry or ram out the empty case, replace broken or worn parts, and clean the chamber if necessary.

(11) The following is a table of immediate action for the most usual stoppages:

Gun Fails to Fire

Check position of safety lever—Place in firing position.

Gun Still Fails to Fire

Not in Battery	In Battery	Breech Not Closed
Check for obstruction between breech ring and mount — remove.	Cock piece by hand and attempt to fire.	Obstruction between breechblock and breech ring — remove obstruction. Close breech; fire.
No obstruction. Depress muzzle 9 degrees. Remove excess oil.	Gun still fails to fire.	No obstruction.
Re-lay the weapon and fire.	Check firing mechanism.	Dirty or bulged round.
	Gun still fails to fire.	Remove round, reload, and fire.
	Remove round, reload, and fire.	

A quick inspection of the gun should disclose the necessary line of action to be taken. If the above chart has been followed and the gun remains out of action, a more detailed inspection must be made.

61. GUN MALFUNCTIONS.

a. Fails to Fire When Firing Plunger is Operated and Percussion on Primer is Obtained.

Cause	Correction
Defective primer.	After three percussions, wait at least two minutes before opening breech, then insert another round of ammunition. If successive rounds fail to fire, the procedure below will be followed.

b. Fails to Fire Until after Several Percussions on Primer; or Fails to Fire when Percussion is Obtained on Successive Rounds of Ammunition.

Insufficient blow on primer; firing mechanism parts not working freely.	Remove firing spring retainer, firing spring, and firing pin guide assembly. Wash parts with SOLVENT, dry-cleaning. Check freedom of firing pin guide in bore of breechblock, and of firing spring stop in guide, disassembling firing pin and

MALFUNCTIONS AND CORRECTIONS

Cause	Correction
	guide if necessary. Remove any burs with oilstone or fine file. Lubricate with OIL, engine (seasonal grade). Replace broken or damaged parts.
Insufficient blow on primer due to broken or weak firing spring.	Replace firing spring.
Broken or deformed point on firing pin.	Replace firing pin.

c. Fails to Fire; No Percussion on Primer.

Broken firing spring. Broken or deformed firing pin.	Disassemble and replace broken or deformed parts.
Sear not retaining firing pin in cocked position.	Disassemble sear and sear spring, wash with SOLVENT, dry-cleaning, and lubricate with OIL, engine (seasonal grade). Check firing plunger for freedom of action. Replace broken or damaged parts.
Broken or deformed cocking lever	Replace the unserviceable part.

d. Failure to Extract Cartridge Case.

Broken extractor.	Ram case out. Examine chamber for deformations or irregularities which might cause difficult extraction. Remove breechblock and replace broken extractor.

e. Breech Fails to Close When Extractors are Forced Forward.

Broken closing spring or broken chain.	Disassemble closing spring mechanism and replace broken part.

f. Breechblock Fails to Travel to Fully Closed Position when Extractors are Forced Forward.

Improper chambering of cartridge case.	Attempt to close the breechblock. If breechblock will not close manually, open the breech and insert another round. If the malfunction recurs proceed as below.
Lack of proper compression of closing spring.	Adjust tension by means of the spring piston rod nut.

Cause	Correction
Lack of lubrication on breechblock bearing surfaces.	Clean and lubricate.
Breechblock seized.	Report to ordnance maintenance company.

62. MOUNT MALFUNCTIONS.

a. Gun Recoils More Than Normal.

Insufficient oil in recoil mechanism.	Refill recoil system. See section VI, paragraph 46.

b. Ejector Cam Does Not Operate Spline Shaft.

Weak or broken cam return spring.	Replace spring.
Pivot pin binds in bracket.	Drift out pin. Free up by hand stoning.

c. Firing Lever Does Not Depress Plunger.

Excessive clearance between lever and plunger.	Readjust firing lever rod. See section VII, paragraph 56 b (1).
Binding of rod end pins.	Free up all rod end pins.
Binding of firing shaft.	Free up firing shaft.
Inoperative solenoid.	Report to ordnance personnel.
Release lever shaft broken, or positioned in "SAFE" position.	Check position of firing shaft release lever. Replace broken shaft.

d. Firing Lever Does Not Return.

Refer to subparagraph c above.	Refer to subparagraph c above.
Broken or weak firing shaft return spring.	Replace spring.
Missing return spring cotter pin.	Install cotter pin.
Binding in manual firing pedal or shaft.	Free up, adjust or replace as necessary.

e. Handwheel Will Not Elevate or Depress Cradle.

Shifter lever in out of mesh position.	Place lever in proper position.

MALFUNCTIONS AND CORRECTIONS

Cause	Correction
Shifter lever broken.	Replace shifter lever.
Handwheel loose on shaft.	Inspect for damaged key. Tighten handwheel nut.
Broken or chipped elevating gears.	Report to ordnance personnel.
Pinion, worm, or handwheel shaft bearings broken or binding.	Report to ordnance personnel.
Foreign matter in gear box causing bind.	Report to ordnance personnel.
Worm binds on worm wheel.	Report to ordnance personnel.

f. Cradle Binds or Will Not Elevate or Depress.

Broken or binding trunnion pin bearings.	Report to ordnance personnel.
Chipped elevating gear rack.	Replace rack.
Bind in periscope linkage or periscope interference at turret.	Adjust periscope cam and synchronizing rod. Replace bearings in rod connectors.
Foreign matter between shield and cradle.	Remove flash and other foreign matter.

63. CAL. .50 GUN AND MOUNT MALFUNCTIONS.

a. Gun Malfunctions Refer to Pertinent Technical Manuals.

b. Mount Malfunctions.

(1) TRAVERSING RING BINDS, DIFFICULT TO OPERATE.

Dirt or foreign matter in bearings. Insufficient lubrication.	Clean bearing race with SOLVENT, dry-cleaning. Replace damaged bearings. Lubricate bearings.

(2) GUN DIFFICULT TO ELEVATE.

Broken torsion balance spring.	Replace spring.

(3) MOUNT LOOSE ON ITS SUPPORTS.

Loose screws and bolts.	Tighten support and bracket attaching screws.

Section IX

DISASSEMBLY AND ASSEMBLY OF GUNS IN TURRET

	Paragraph
General	64
Tools	65
Firing pin and guide assembly	66
Breechblock assembly	67
Spline shaft group	68
Closing spring group	69
Breech ring and breech ring key	70
Firing plunger	71
Cal. .50 A.A. machine gun M2	72

64. GENERAL.

a. This section is provided to acquaint the using troops with the disassembly and assembly of the armament. When cleaning and inspecting the various assemblies, follow the procedures outlined in sections VI and VII. When broken or badly worn parts need to be replaced, use this section as a guide. Difficulties which cannot be remedied by the prescribed methods must be reported to the ordnance officer. Filing of any part is prohibited, unless outlined in field manuals or ordered by the car commander in emergencies. Wrenches which do not fit properly must not be used. An oversize wrench usually fails to tighten parts properly and often damages nuts and bolt heads; also, the wrench head may spread out of shape, rendering it useless. In all assembly operations, give special care to the cleaning and lubrication of bearings, gear teeth, sliding surfaces, and threads. Parts which cannot be satisfactorily reconditioned should be replaced.

CAUTION: Before starting gun disassembly, always make sure that the cartridge chamber is empty and close the breech. Depress the firing plunger to make sure the gun is not cocked.

65. TOOLS.

a. The tools necessary to completely service the 76-mm gun and mount are listed, described and illustrated in section XI.

66. FIRING PIN AND GUIDE ASSEMBLY (fig. 16).

a. **Equipment.**

PUNCH, $\frac{3}{32}$-in.
SCREWDRIVER TGAX1B
TOOL, firing spring retainer A206982

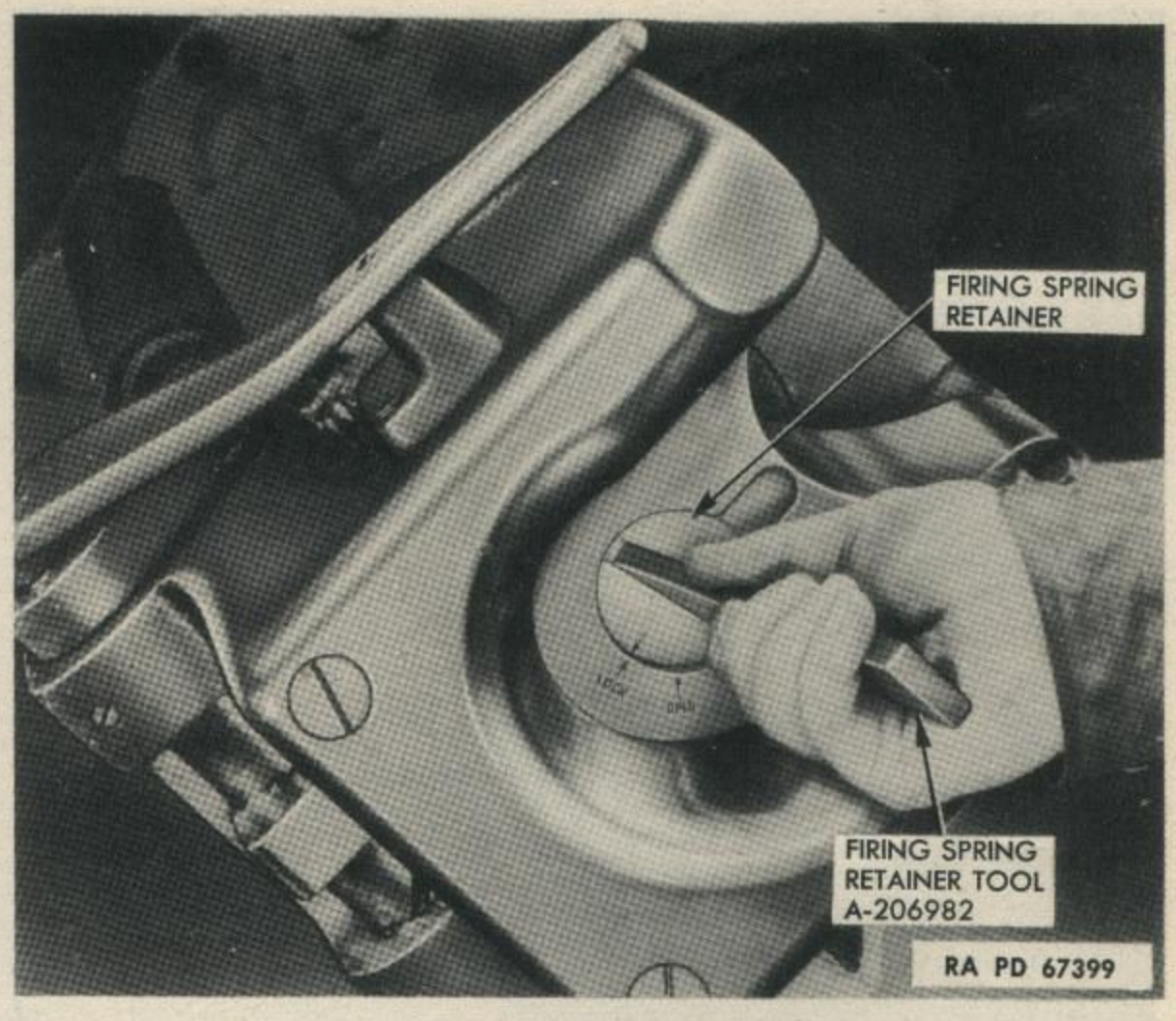


Figure 61 — Removing Firing Spring Retainer

b. Removal.

(1) Depress the firing plunger to make certain the gun is not cocked.

(2) Remove the firing spring retainer with firing spring retainer tool A206982, by pressing forward and at the same time rotating counterclockwise until arrows on the face of the breechblock and retainer index at "OPEN" position (fig. 61). The firing spring retainer will then come out under force of the firing spring (fig. 62).

(3) Remove the firing spring.

(4) Remove the cover plate, cocking fork plunger and plunger spring.

(5) Depress firing plunger and remove the firing pin and guide assembly.

c. Disassembly (fig. 16).

(1) Remove firing pin guide pin by depressing the firing spring stop and forcing the guide pin out with a small punch.

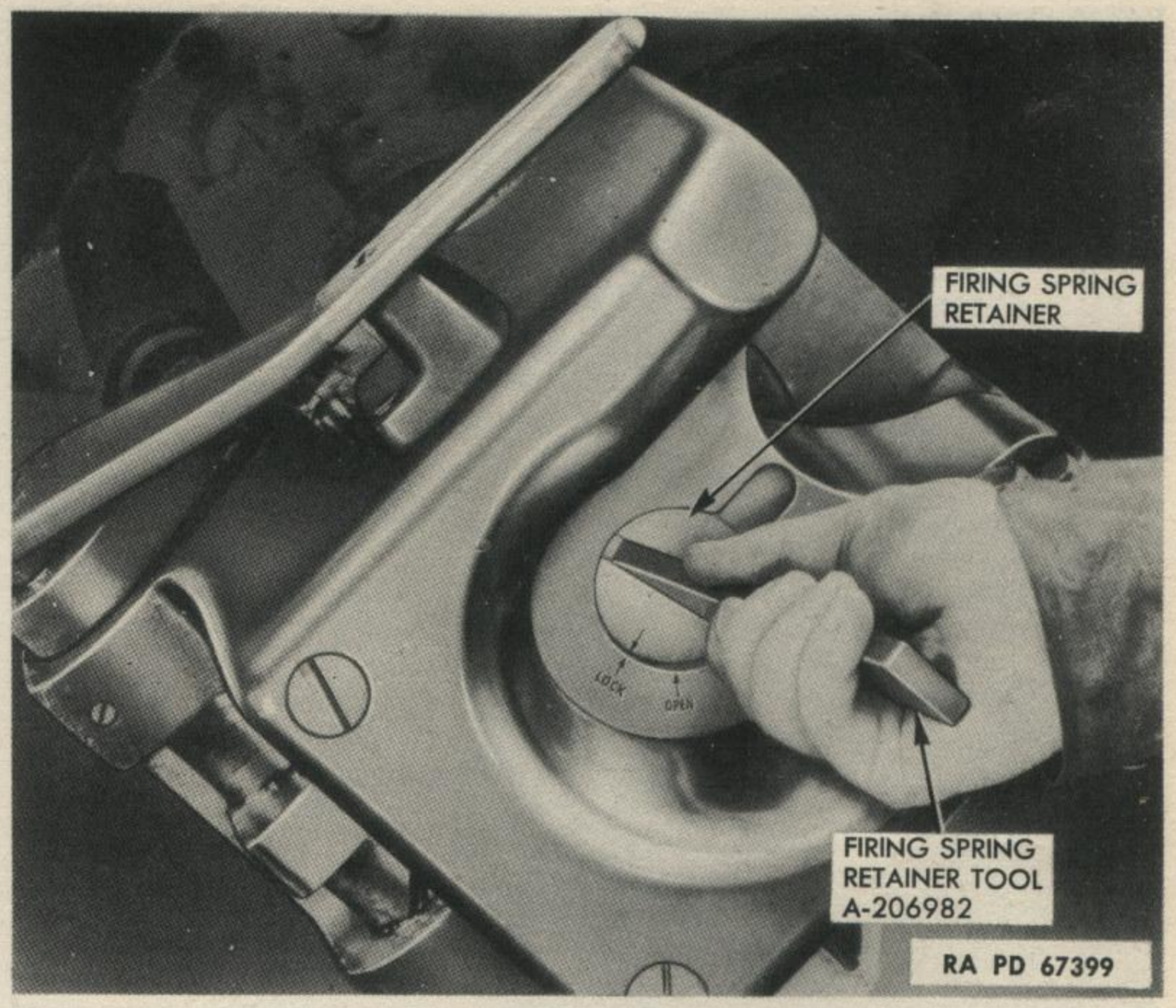


Figure 61 — Removing Firing Spring Retainer

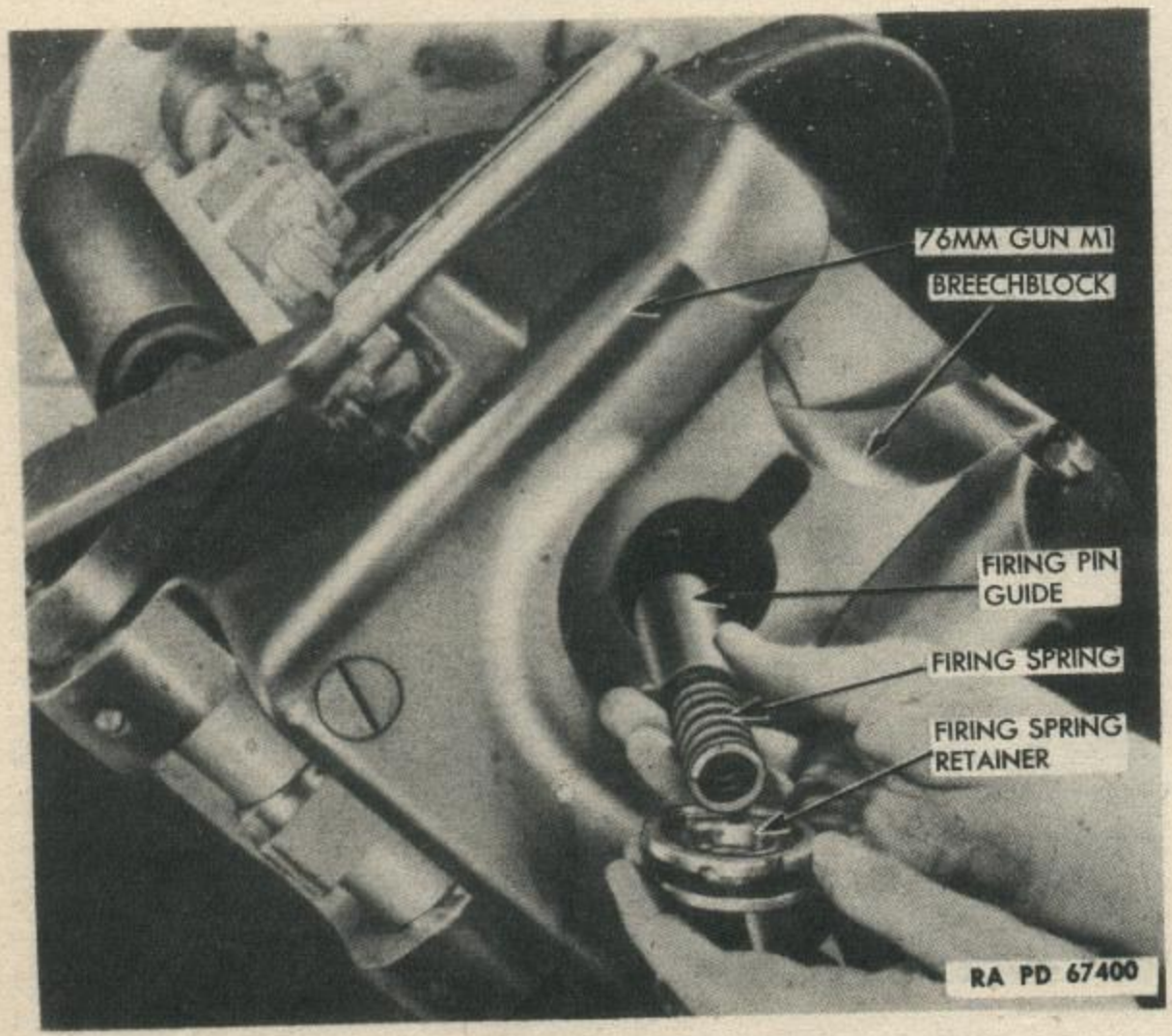


Figure 62 — Removing Firing Pin and Guide Assembly

(2) Unscrew the firing pin and remove the firing pin retracting spring and firing spring stop from the guide.

d. Assembly.

(1) Insert the firing spring stop in the guide, making sure projections on stop extend through the holes in the guide.

(2) Place firing pin retracting spring over the firing pin, and screw the pin into the guide as far as it will go.

(3) Depress the firing spring stop and install the guide pin. It may be necessary to unscrew the firing pin slightly to line up the guide pin hole.

e. Installation.

To install, reverse the removal procedure (fig. 16).

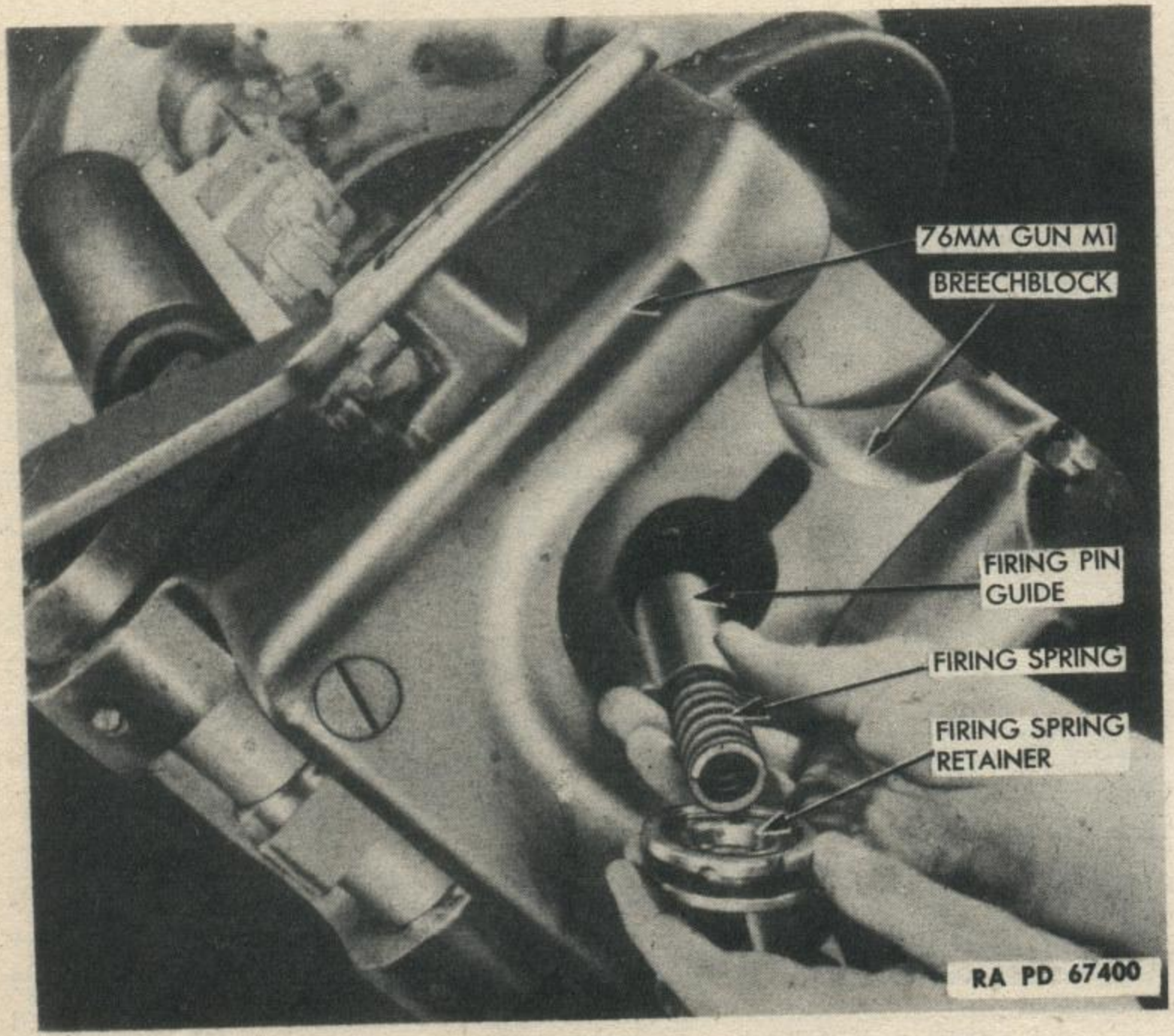


Figure 62 — Removing Firing Pin and Guide Assembly

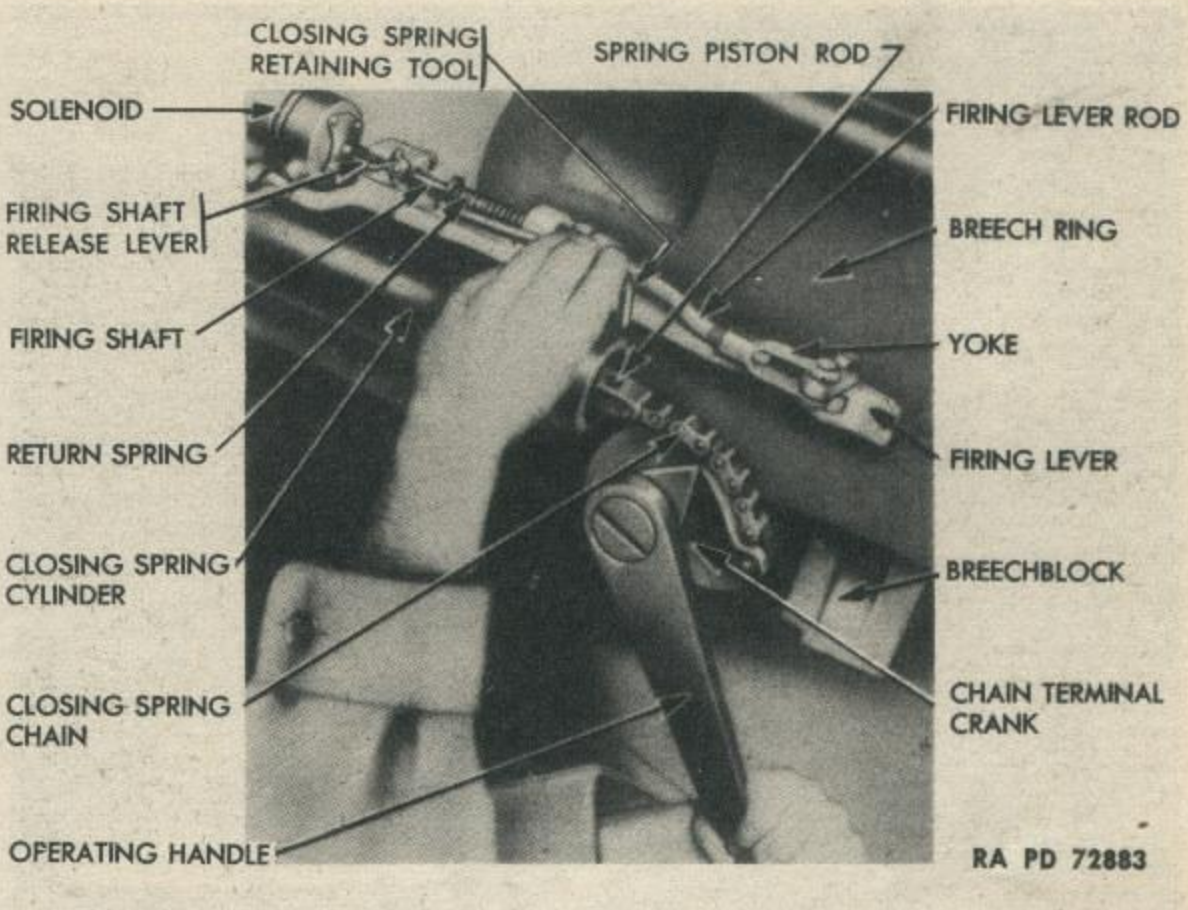


Figure 63 — Installing Closing Spring Retaining Tool

67. BREECHBLOCK ASSEMBLY.

a. Equipment.

EYEBOLT, breechblock lifting A206984

SCREWDRIVER, special for breechblock bushing C70577

TOOL, breechblock support B163768

TOOL, closing spring retaining

TOOL, firing spring retainer A206982

TOOL, operating shaft plunger removing A206983

TOOLS, hand, contained in vehicle tool kit.

WRENCH, firing plunger retainer B163767

WRENCHES, socket head set screw, 1/8-, 1/4-, 5/16-, 3/8-in.

b. Removal.

(1) Remove the attaching screws and turret top rail.

(2) Remove turret extension plate and cover.

(3) Remove radio.

(4) Unscrew the four attaching screws and remove recoil guard assembly, depressing gun and turning recoil guard assembly as necessary to permit clearance with the turret.

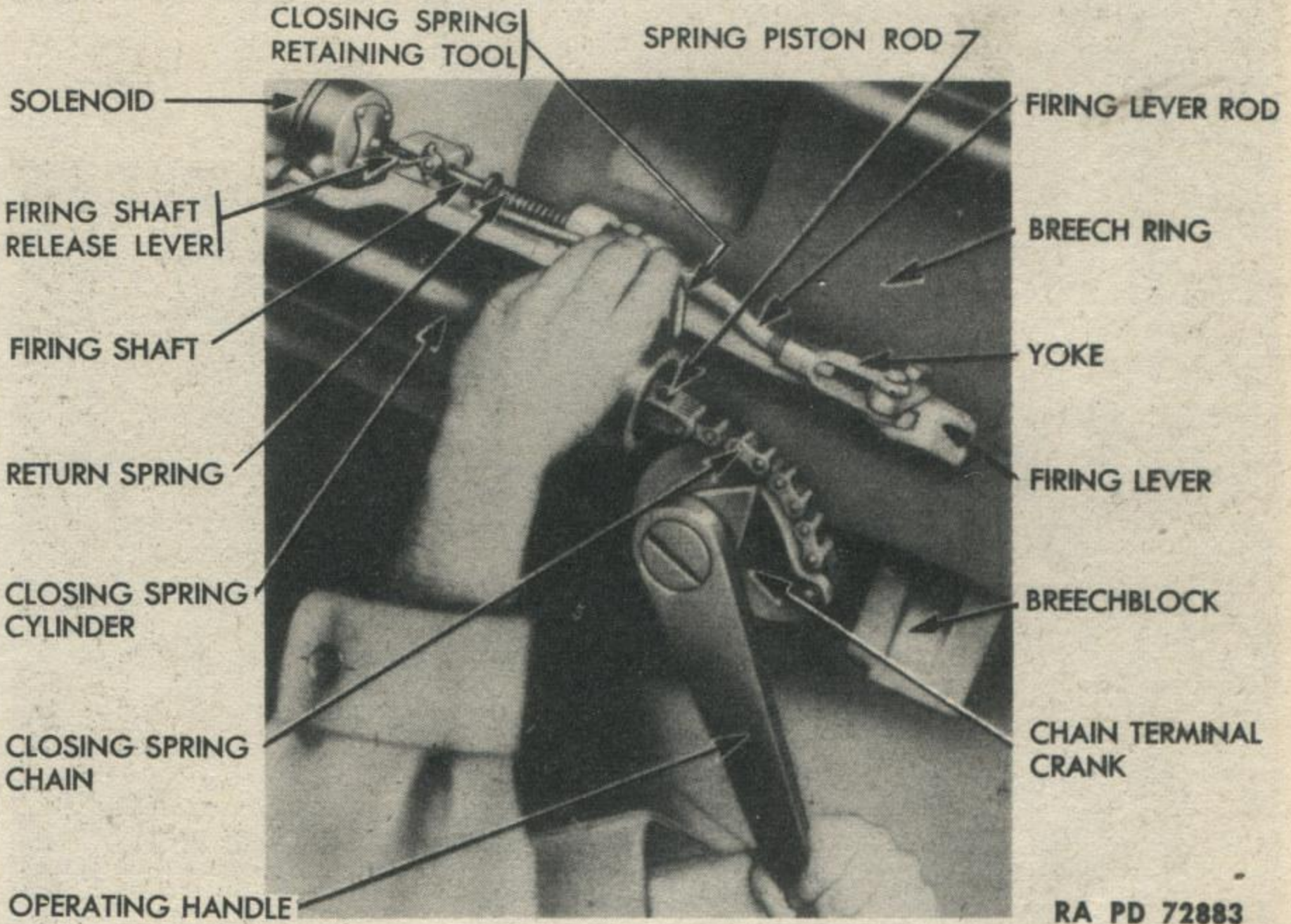


Figure 63 — Installing Closing Spring Retaining Tool

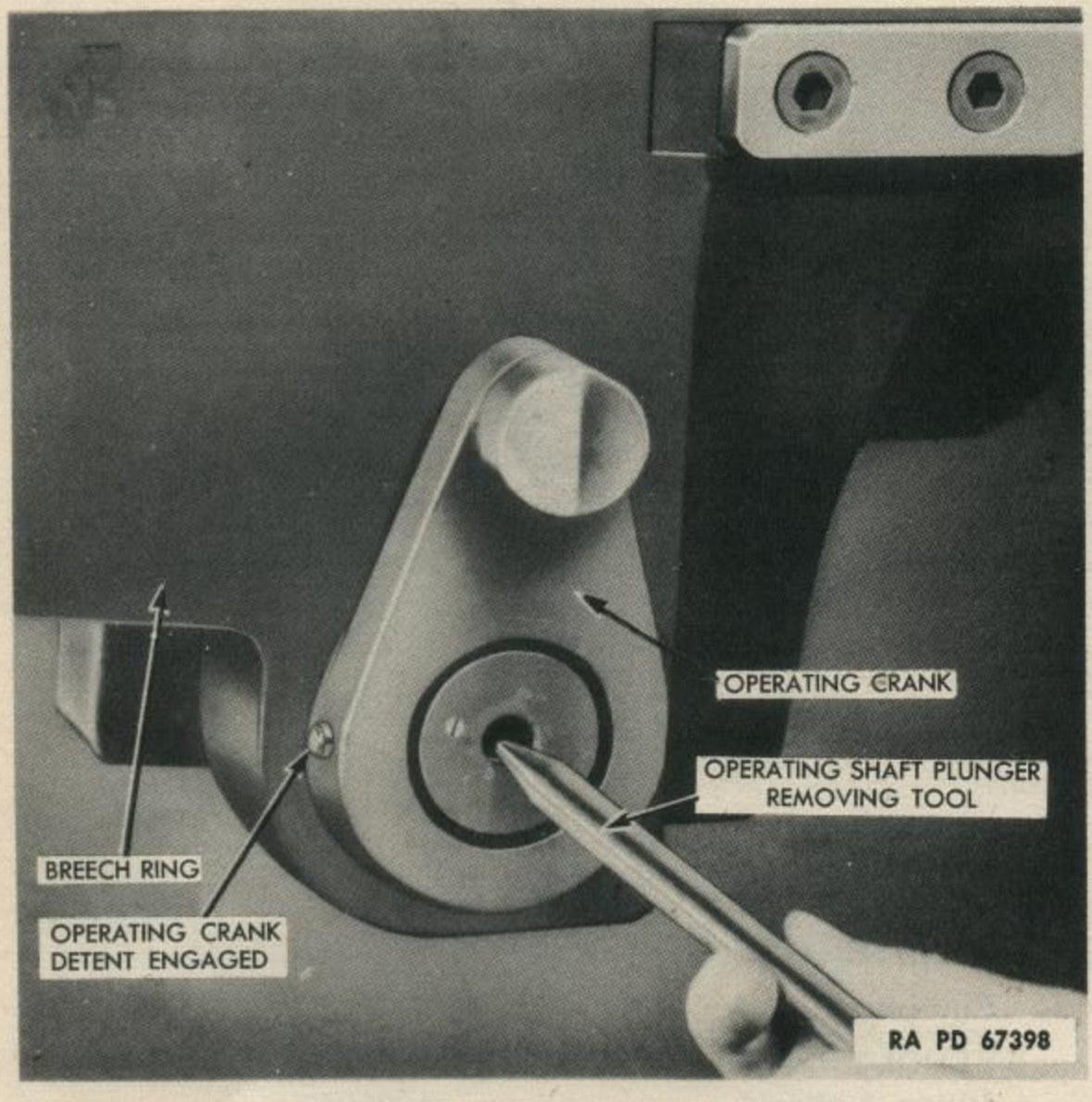


Figure 64 — Inserting Operating Shaft Plunger Removing Tool

(5) Remove the firing spring retainer, the firing spring, cover plate, cocking fork plunger, plunger spring, and firing pin and guide assembly as described in paragraph 66.

(6) Screw threaded eyebolt A206984 in the top of breechblock as far as it will go. Depress the firing plunger so gun will not be cocked.

(7) By means of the operating handle, rotate the spline shaft toward the rear of the gun, lowering the breechblock just far enough to permit a retaining tool to be inserted in the ½-inch hole in the spring piston rod (fig. 63).

(8) Raise the breechblock by means of the eyebolt to approximately closed position, looping the slackened chain upward to avoid interference. Insert the breechblock support tool B163768 in the central bore of the breechblock with the flange downward to support the breechblock of the bottom of the U-notch of the breech ring.

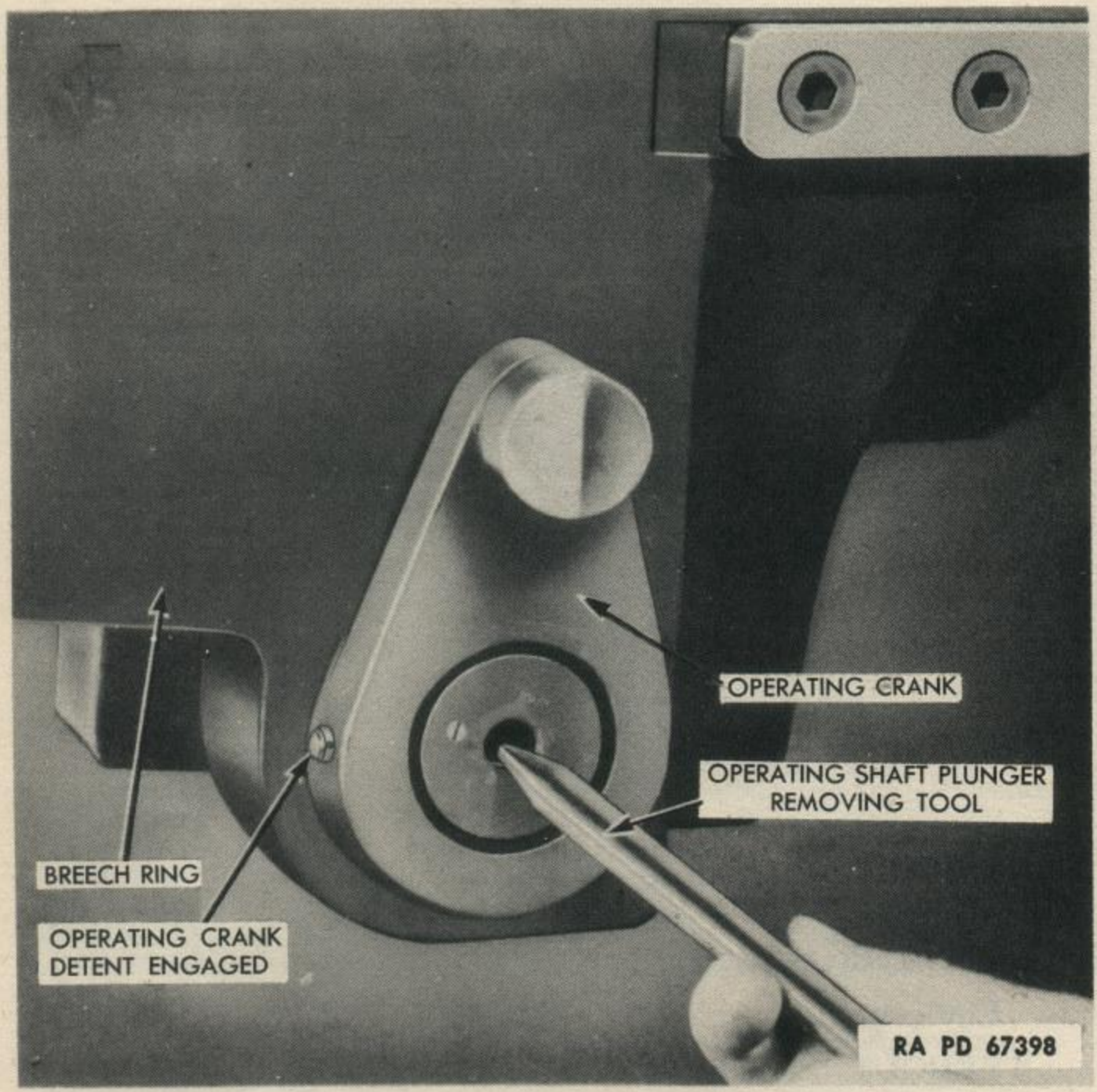


Figure 64 — Inserting Operating Shaft Plunger Removing Tool

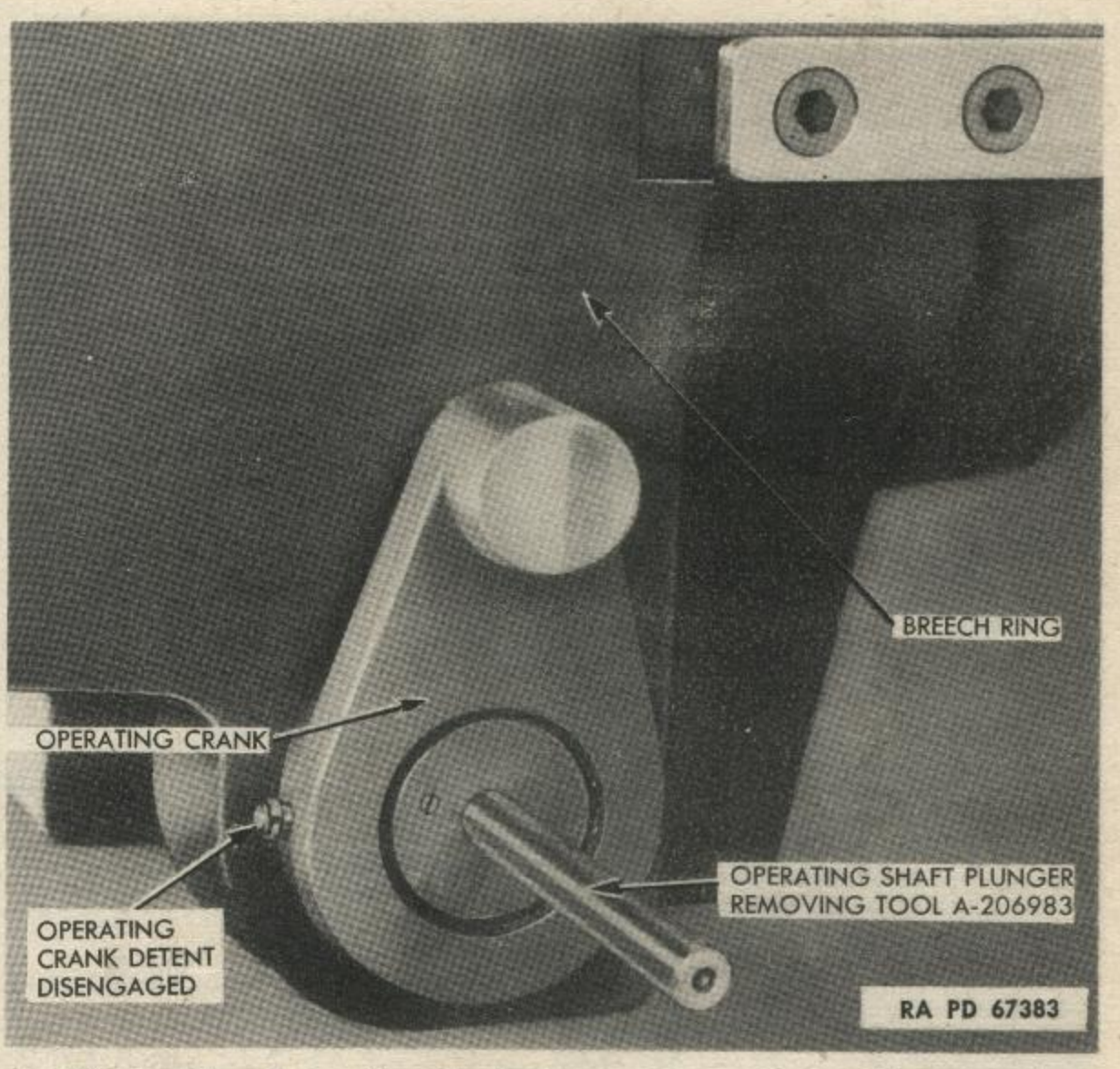


Figure 65 — Operating Shaft Plunger Removing Tool Inserted

(9) With the operating handle unlatched, depress the plunger in the right end of the spline shaft by inserting tool A206983 and push the shaft slightly to the left (figs. 64 and 65). Remove the tool. Now support the breechblock crank assembly at the bottom of the breechblock with the right hand while removing the spline shaft and operating handle assembly from the left of the gun (fig. 66). Removing the spline shaft will release the breechblock crank assembly and the cross heads (two bronze blocks) (fig. 67). NOTE: Do not allow these parts to drop and strike the turret floor.

(10) Remove the extractor plunger plugs, extractor plunger springs and extractor plungers (figs. 68 and 69).

(11) Lift the breechblock out of the breech ring by means of the eyebolt.

(12) Remove both extractors from the breech ring.

c. Disassembly.

(1) Remove breechblock support tool B163768.

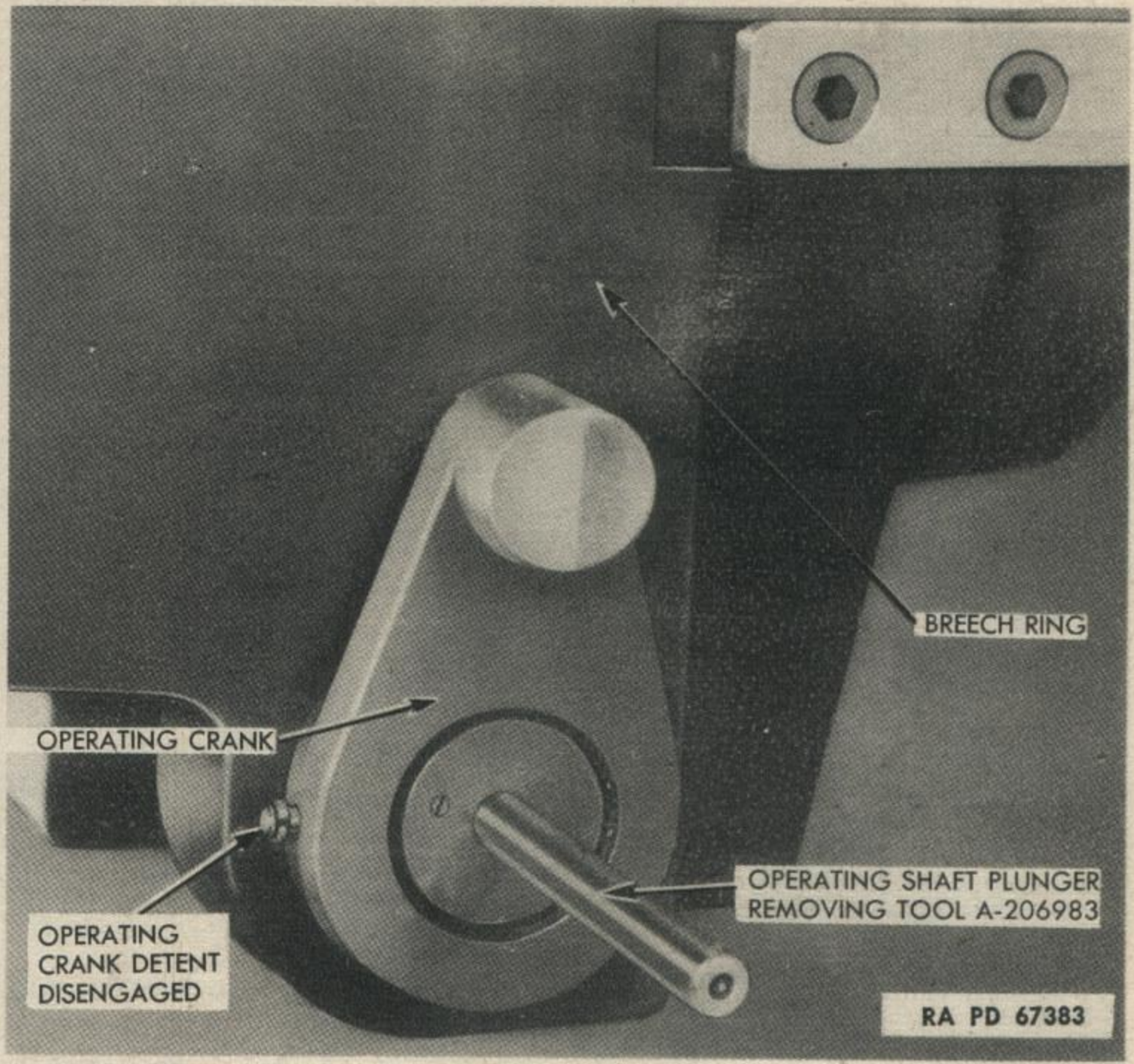


Figure 65 — Operating Shaft Plunger Removing Tool Inserted

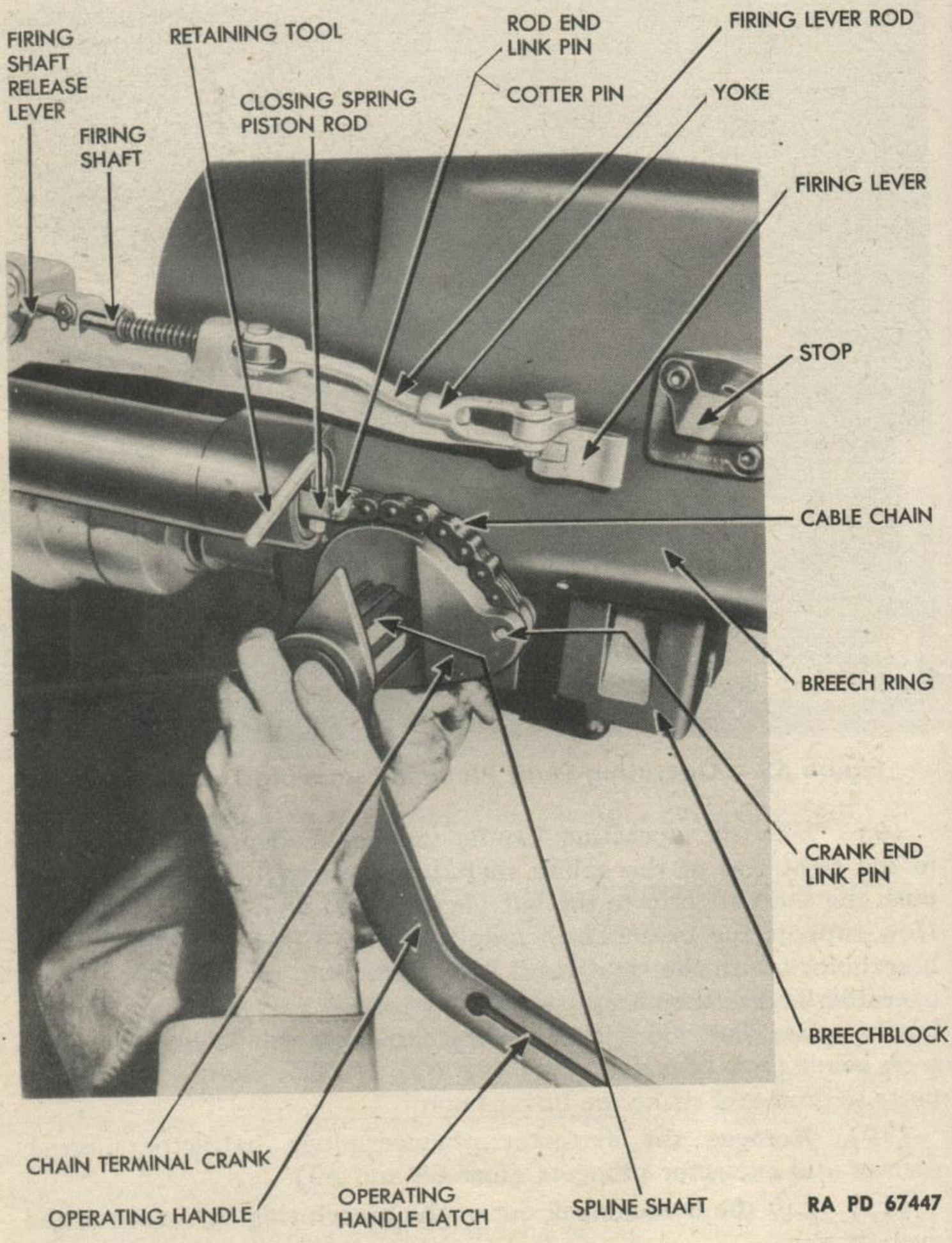


Figure 66 — Removing Spline Shaft and Operating Handle

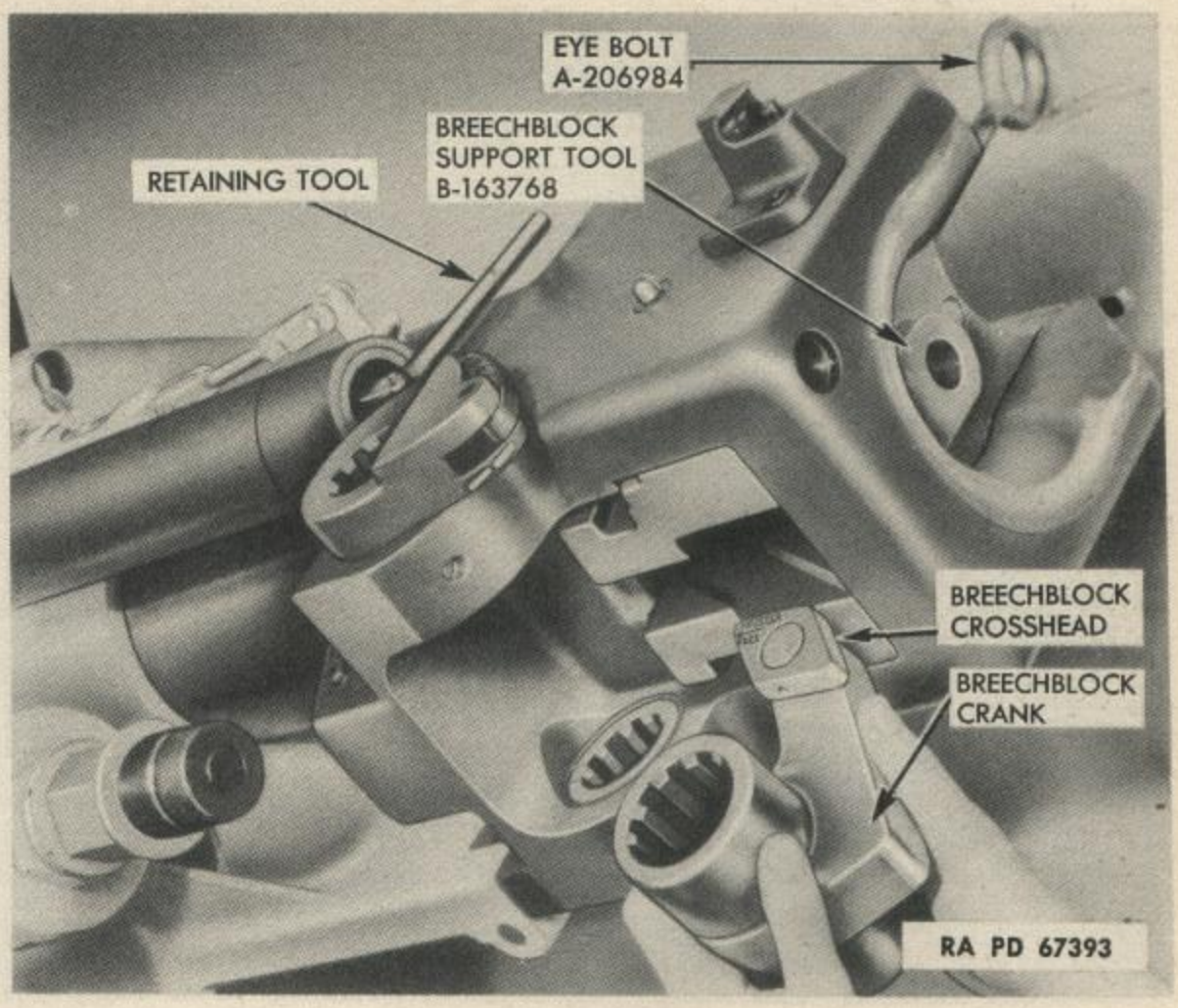


Figure 67 — Removing Breechblock Crank Assembly

(2) Remove the firing pin cocking lever by pulling it straight out from the right side of the breechblock. Remove firing pin cocking fork.

(3) Depress sear and remove sear retainer. Remove sear and sear spring from the left side of the breechblock.

(4) The breechblock bushing is screwed into the breechblock and secured with the breechblock bushing screw. The bushing should not be removed from the breechblock unless it has been damaged or worn, necessitating replacement. If replacement is necessary, remove breechblock bushing screw, and unscrew bushing by means of special screwdriver C70577 inserted through the central bore of the breechblock.

d. Assembly.

(1) Place breechblock on bench, front face down.

(2) Install firing pin cocking fork in the breechblock with the rounded operating surfaces of the fork up.

(3) Install the firing pin cocking lever in the right side of the

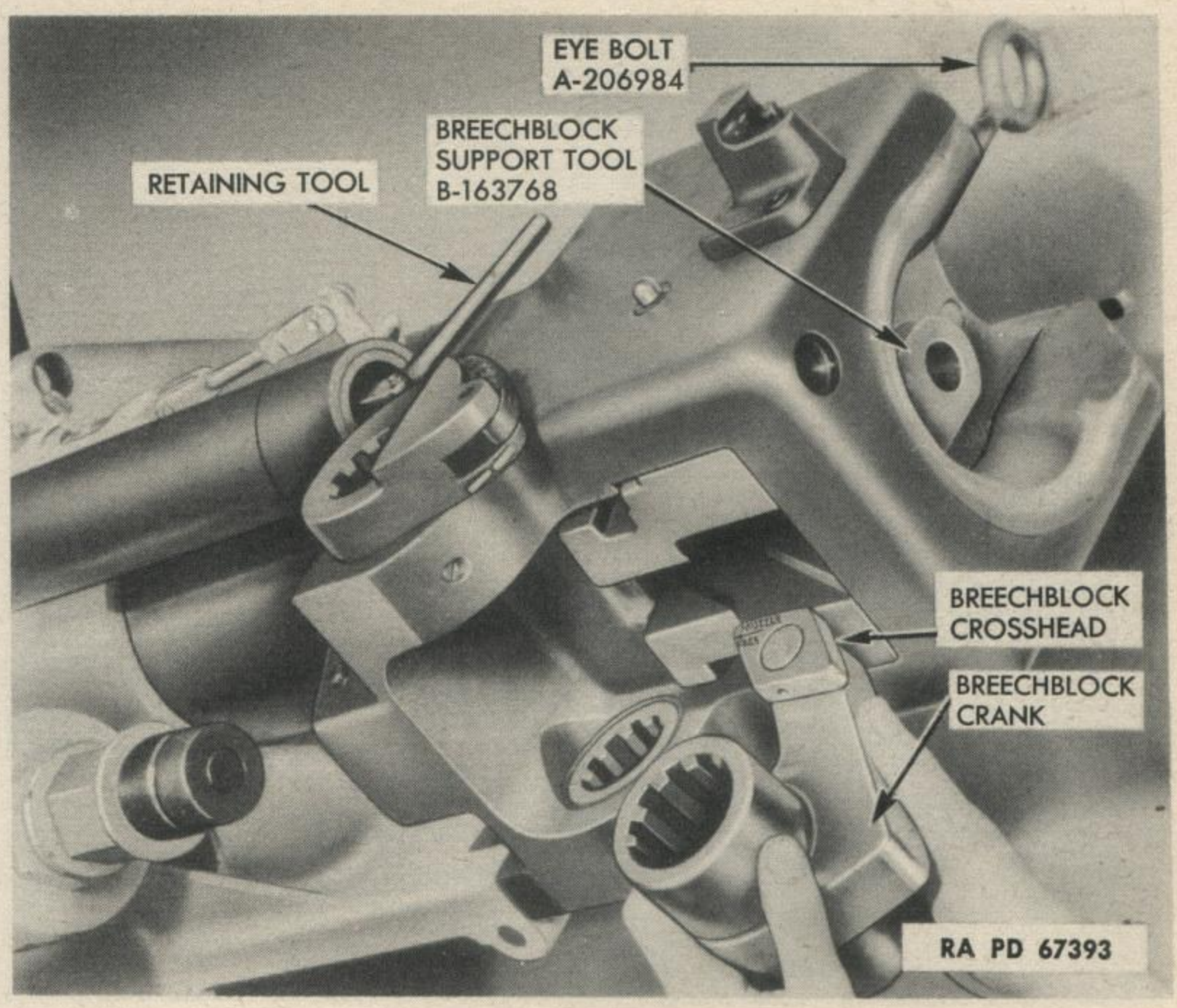


Figure 67 — Removing Breechblock Crank Assembly

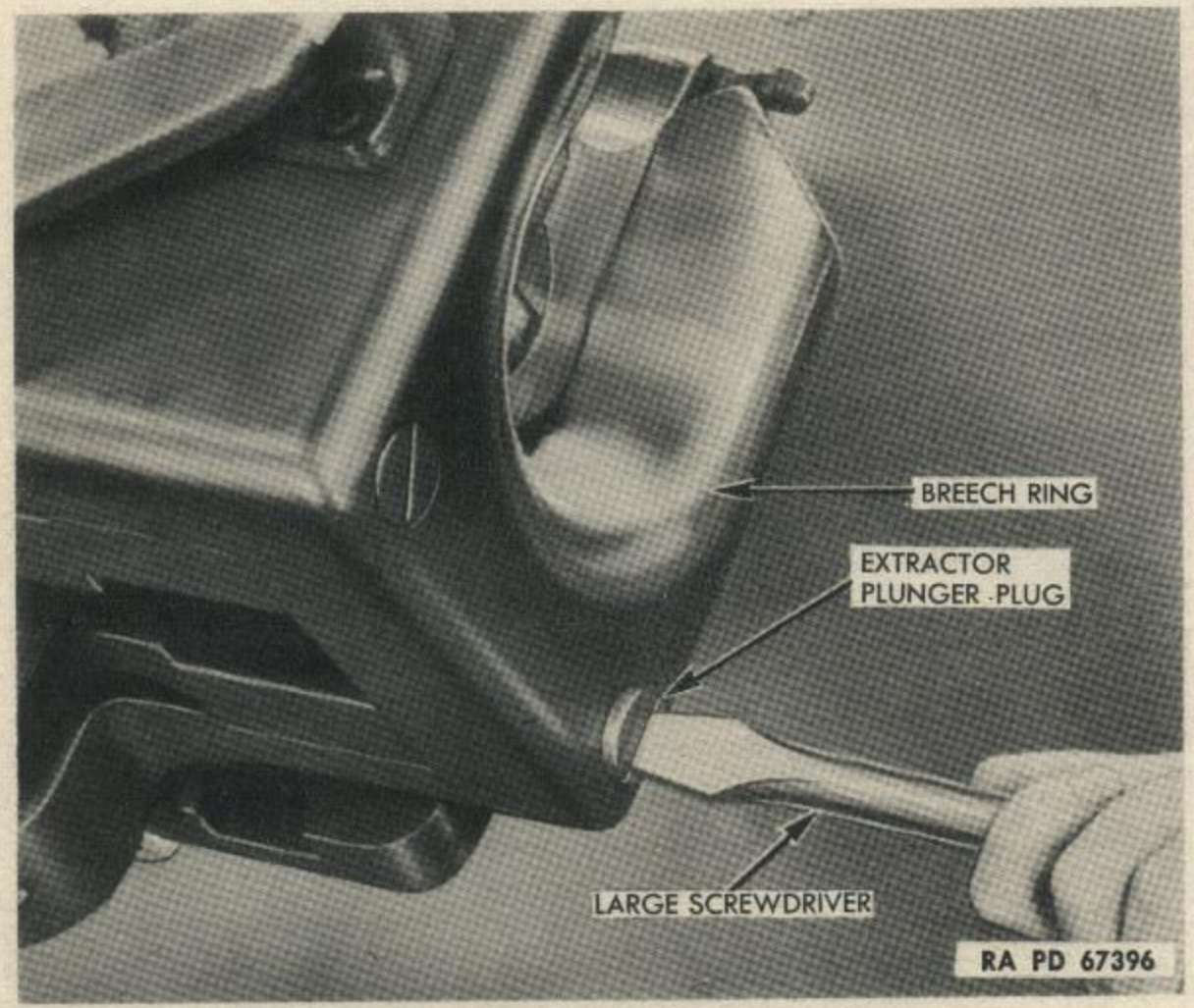


Figure 68 — Removing Extractor Plunger Plugs

breechblock with the concave side up, matching keyway with the slot in the cocking fork.

(4). Place sear spring over the sear and install it from the left side of the breechblock. Depress the sear as far as it will go and install the sear retainer (U-shaped washer) in the groove in the end of the sear.

e. Installation.

(1) Install the support tool B163768 in the central bore of the breechblock with the flange downward.

(2) Install both extractors in the breech ring (fig. 70). Holding extractors forward against the tube and outward against the breech ring, install the breechblock assembly, making sure it clears both extractors as it is lowered into the breech ring until the tool supports the breechblock (fig. 71).

(3) Place the two bronze cross heads on the cross head pivot of the breechblock crank. NOTE: The cross heads must be installed with the ends marked "MUZZLE FACE" on top and toward the front of the gun.

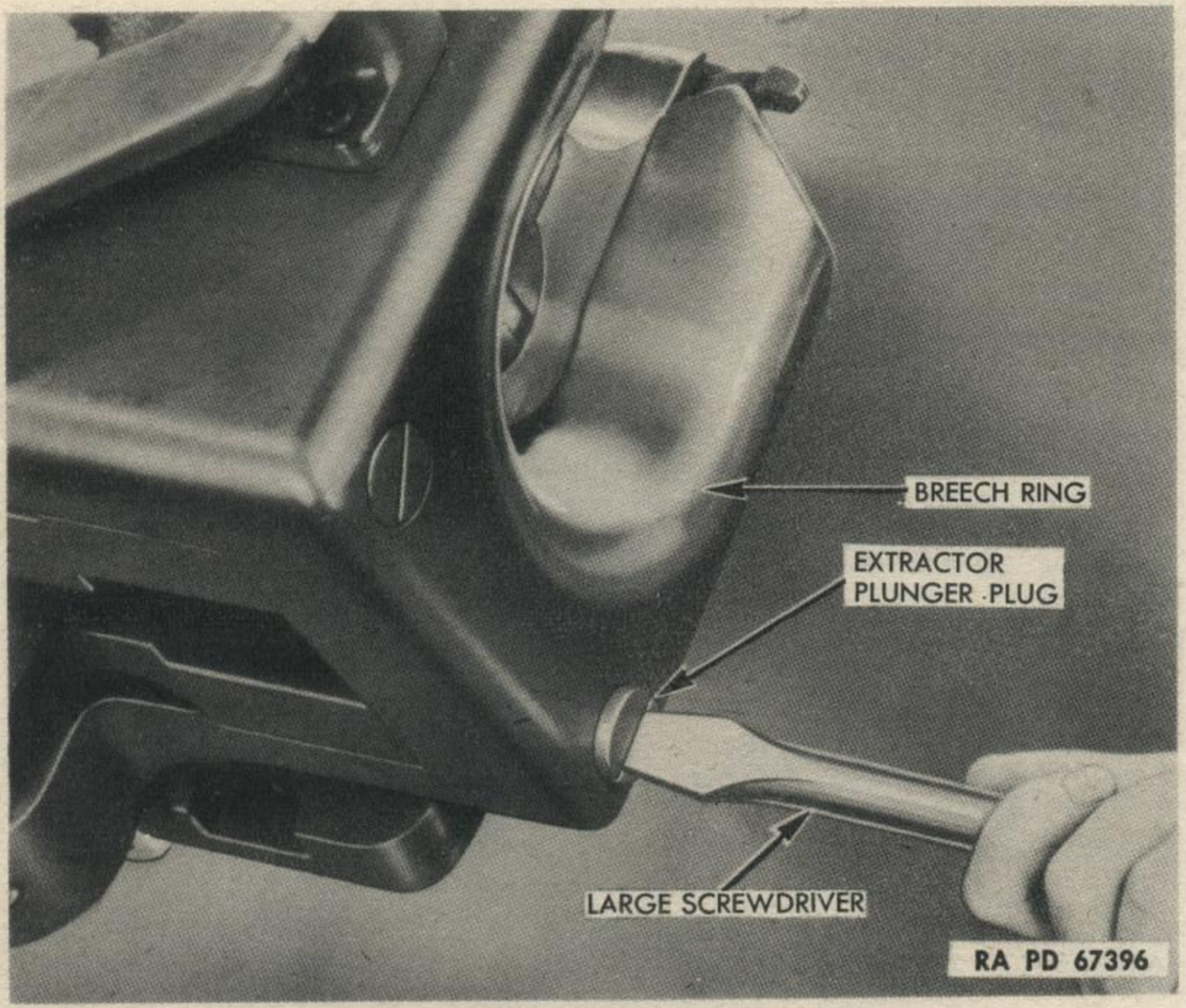


Figure 68 — Removing Extractor Plunger Plugs

DISASSEMBLY AND ASSEMBLY OF GUNS IN TURRET

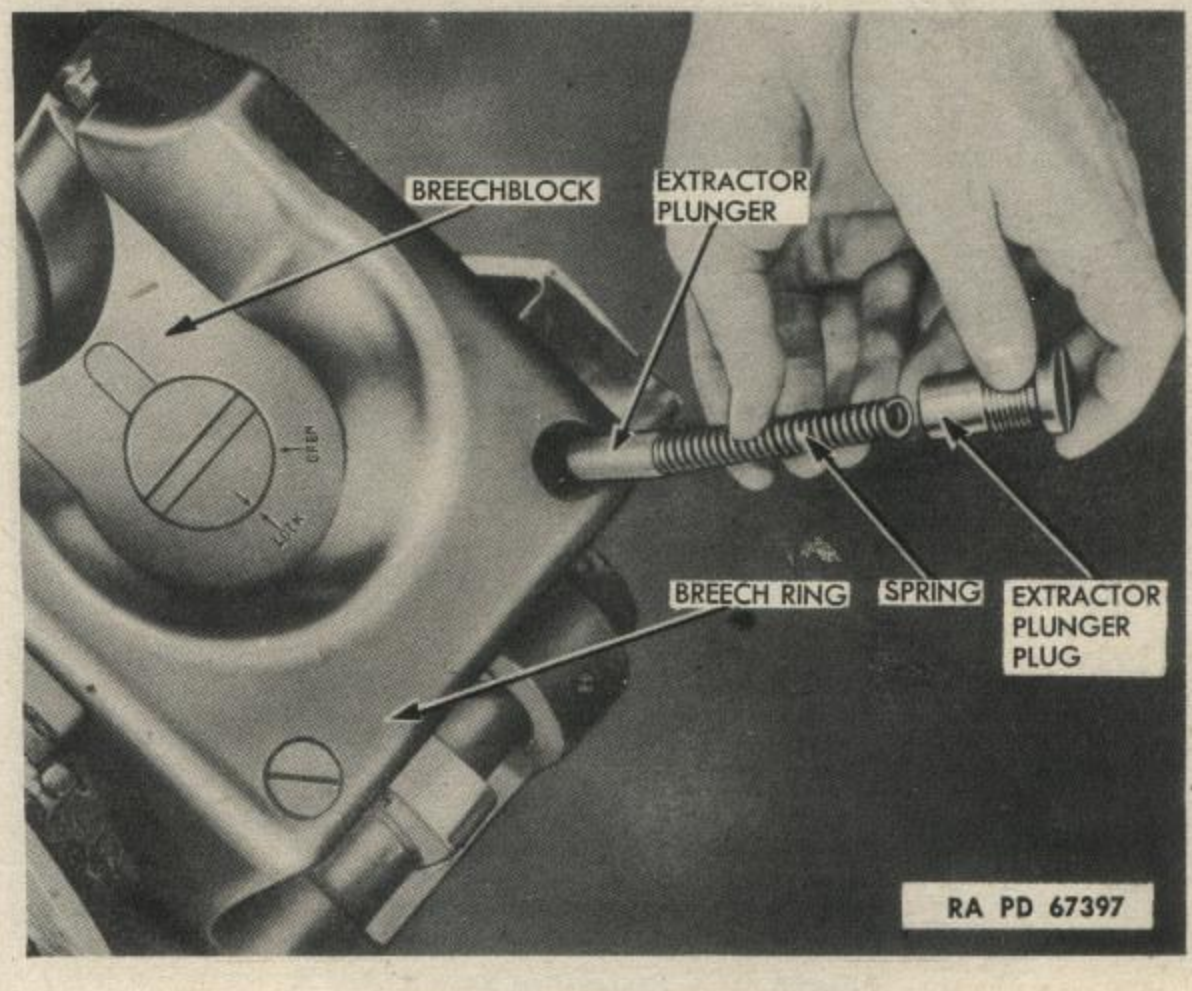


Figure 69 — Removing Extractor Plungers and Springs

(4) Install the breechblock crank in the bottom of the breechblock (with part number to the rear) by sliding the cross heads into the grooves provided (fig. 67). Install the spline shaft with operating handle assembly by pressing inward on the spline shaft and at the same time rotating it slightly to index the splines with those of the breechblock and operating cranks. Install the spline shaft in position as far as it will go, making certain that the detent in the operating crank enters the hole provided in the spline shaft.

(5) Support the breechblock by means of the eyebolt and remove support tool B163768. Lower the breechblock as far as it will go and remove eyebolt. Press downward on the operating handle until breechblock is locked in the open position by the extractors (fig. 18).

(6) Install the extractor plungers, extractor plunger springs, and extractor plunger plugs in the rear of the breech ring. Tighten the plugs securely (fig. 68).

(7) Press downward sufficiently on the operating handle to overcome the tension of the closing spring and remove the closing spring retaining tool. Release the extractors from their locking position by

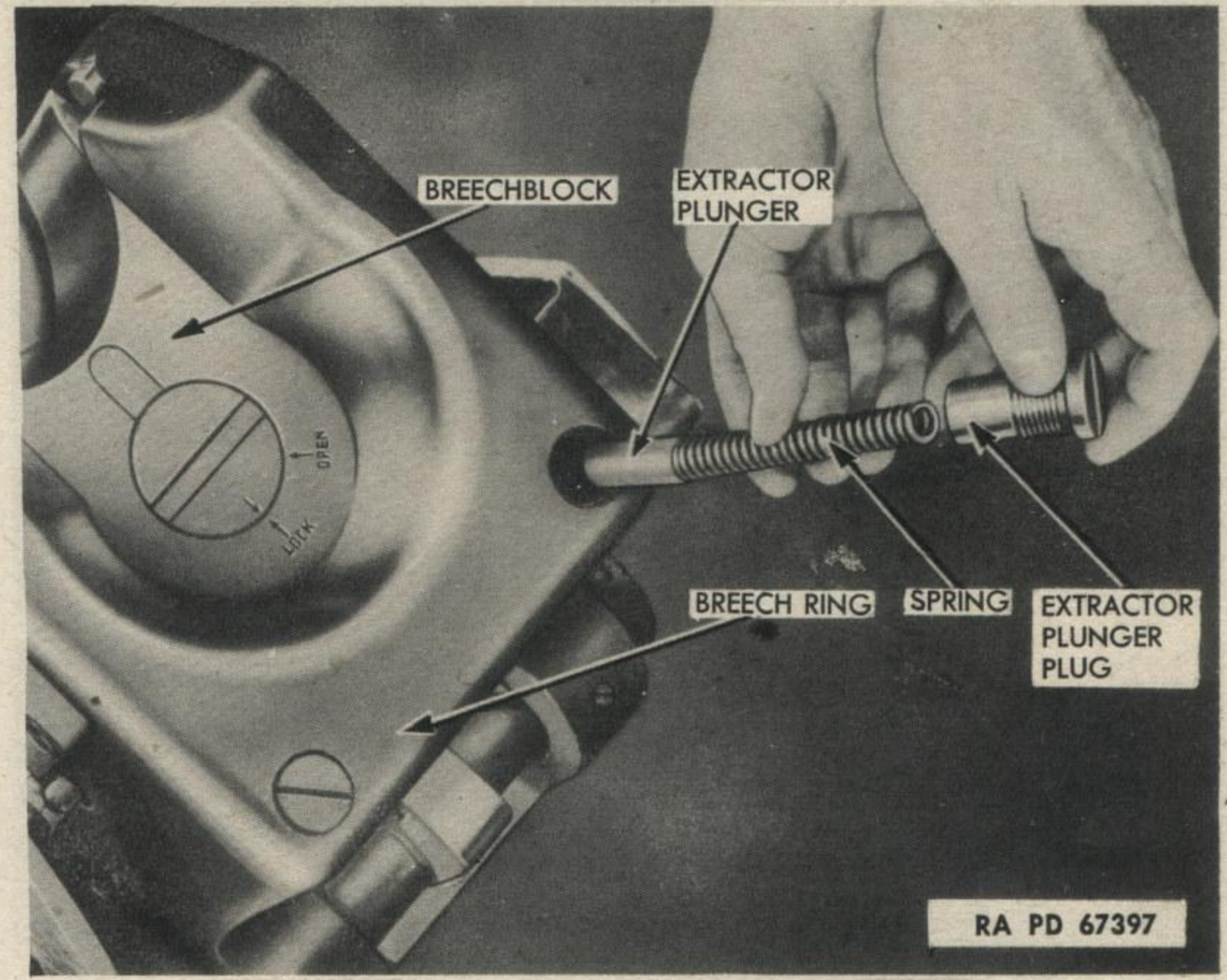


Figure 69 — Removing Extractor Plungers and Springs

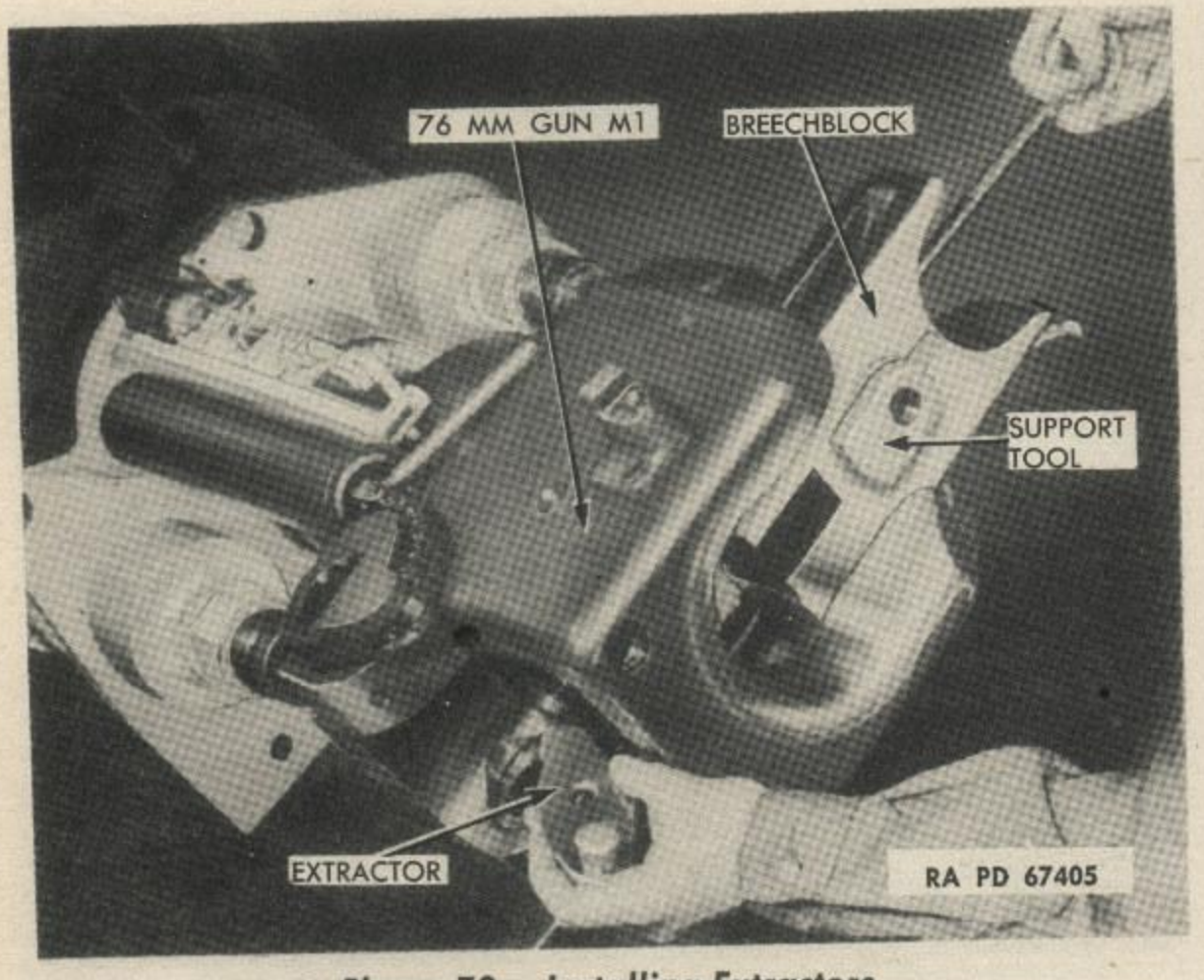


Figure 70 — Installing Extractors

pressing them forward with the base of an empty cartridge case. CAUTION: Do not use hands to release the extractors.

(8) The breechblock can now be eased into its closed position by means of the operating handle which should finally be latched into place (fig. 18).

(9) Depress the firing plunger slightly and install the firing pin and guide assembly.

(10) Install the cocking fork spring and plunger in the cover plate. Install the assembly in the grooves provided in the breechblock with the plunger forward and contacting the firing pin cocking fork.

(11) Install the firing spring.

(12) Install firing spring retainer with its arrow indexing with the "OPEN" arrow on the breechblock. Press forward on the retainer slightly, using tool number A206982, and turn clockwise until arrow indexes with the arrow in the "LOCK" position. Release pressure on the retainer and remove the retainer tool.

(13) Install recoil guard assembly, radio, turret, extension plate and turret, top rail by reversing removal procedure.

NOTE: In the case of certain models, it may be necessary to unscrew the piston rod coupling nuts from the gun breech ring and slide

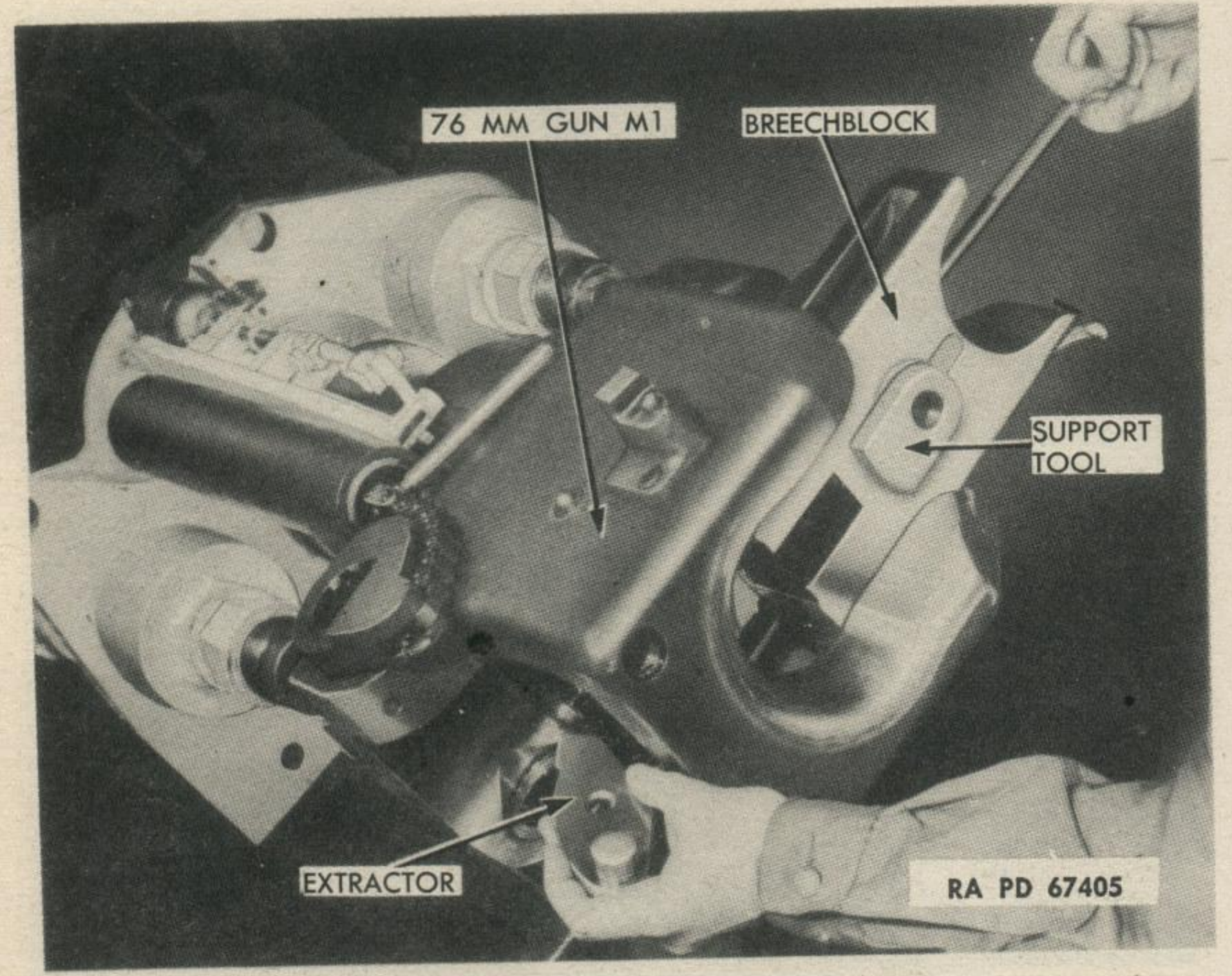


Figure 70 — Installing Extractors

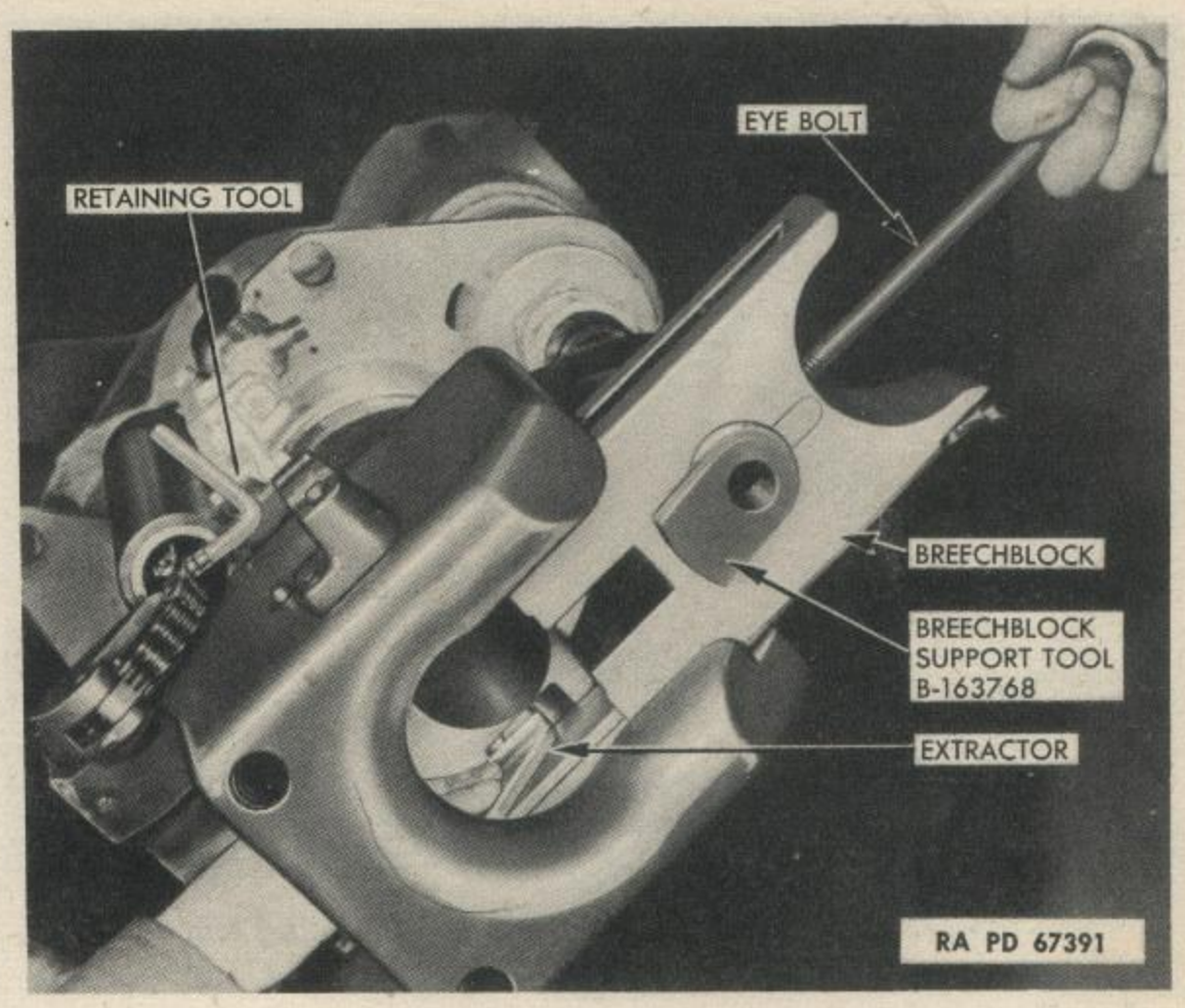


Figure 71 — Positioning Extractors and Lowering Breechblock

the gun rearward out of the cradle sufficiently to permit clearance of the breechblock with the ammunition compartment of the turret. When these piston rod coupling nuts are being unscrewed and during the time they are free from the breech ring it is very important that the gun be in the horizontal position to prevent it sliding rearward out of control and damaging materiel or injuring personnel. The gun should be eased forward for attaching the piston rod coupling nuts, so that the threads of the nuts and breech ring will not be damaged.

68. SPLINE SHAFT GROUP.

a. Equipment.

EYEBOLT, breechblock lifting A206984
TOOL, closing spring retaining
TOOL, operating shaft plunger removing A206983
TOOL, breechblock support B163768
TOOLS, hand, contained in vehicle tool kit
WRENCHES for socket head set screws, 1/8-, 1/4-, 5/16-, 3/8-in.

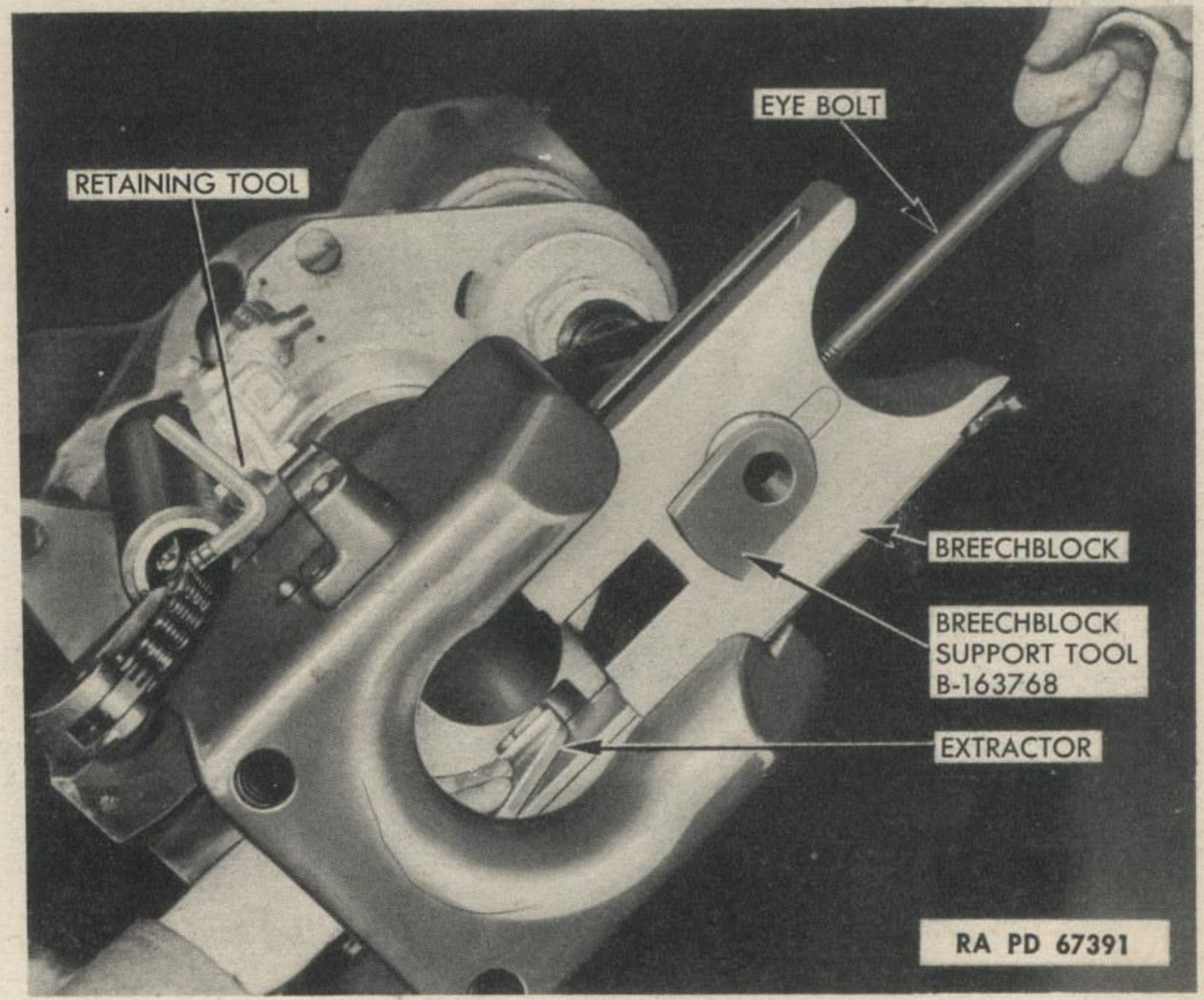


Figure 71 — Positioning Extractors and Lowering Breechblock

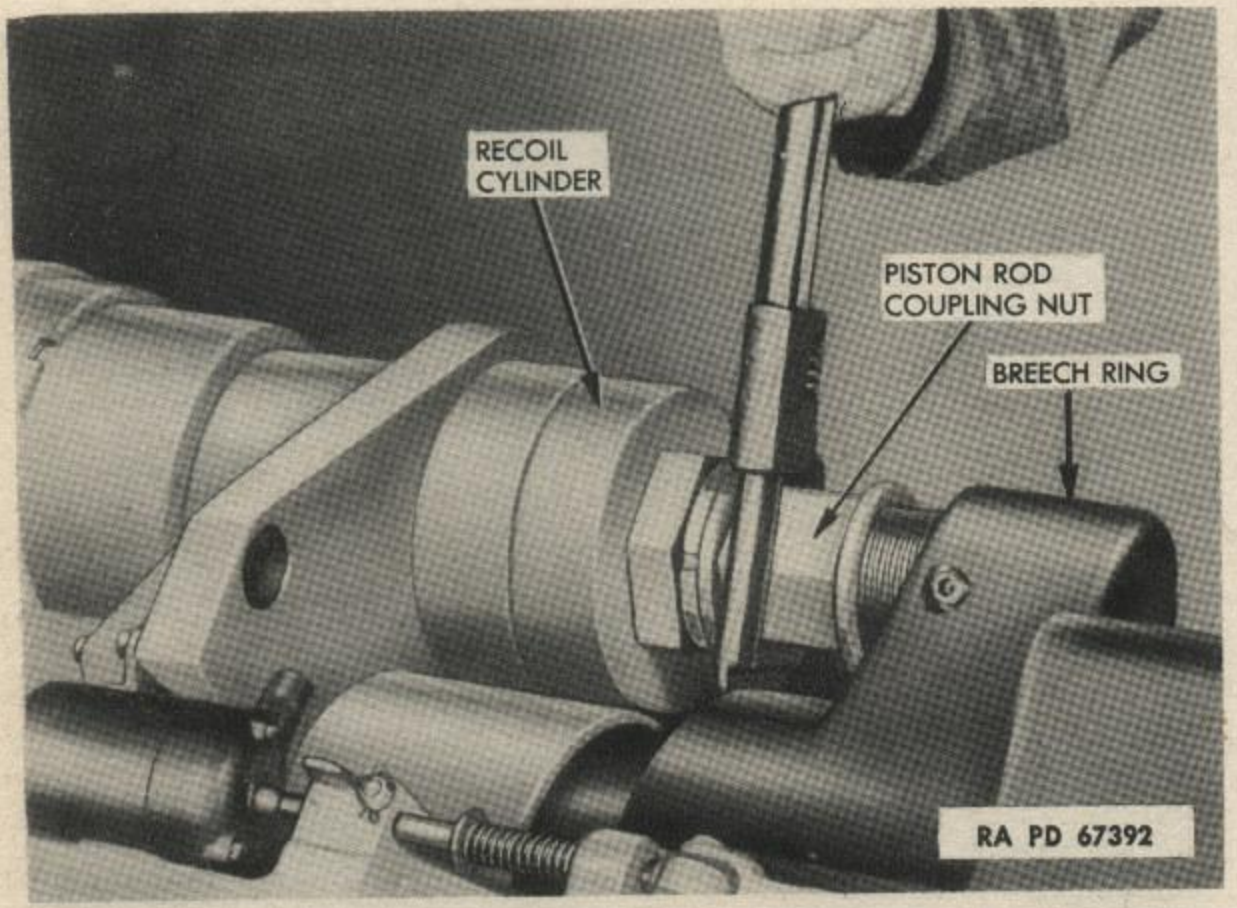


Figure 72 — Unscrewing Piston Rod Coupling Nut

b. Removal.

(1) Remove spline shaft as described in paragraph 67 b.

(2) Unscrew piston rod coupling nuts and slide gun rearward sufficiently for operating crank to clear ejector cam (par. 67 e (13), figs. 72 and 73).

(3) Remove operating crank detent and spring from operating crank by removing the cotter pin. Slide crank from right side of breech ring (fig. 74).

c. Disassembly.

(1) Remove plunger screw from right end of spline shaft and withdraw plunger.

(2) Remove safety set screw, unscrew the operating handle screw and remove the operating handle from the spline shaft.

(3) The operating handle latch is removed by drifting the operating handle latch pin out of the handle (fig. 13).

d. Assembly and Installation.

Assemble spline shaft group and install in gun by reversing the disassembly and removal procedure.

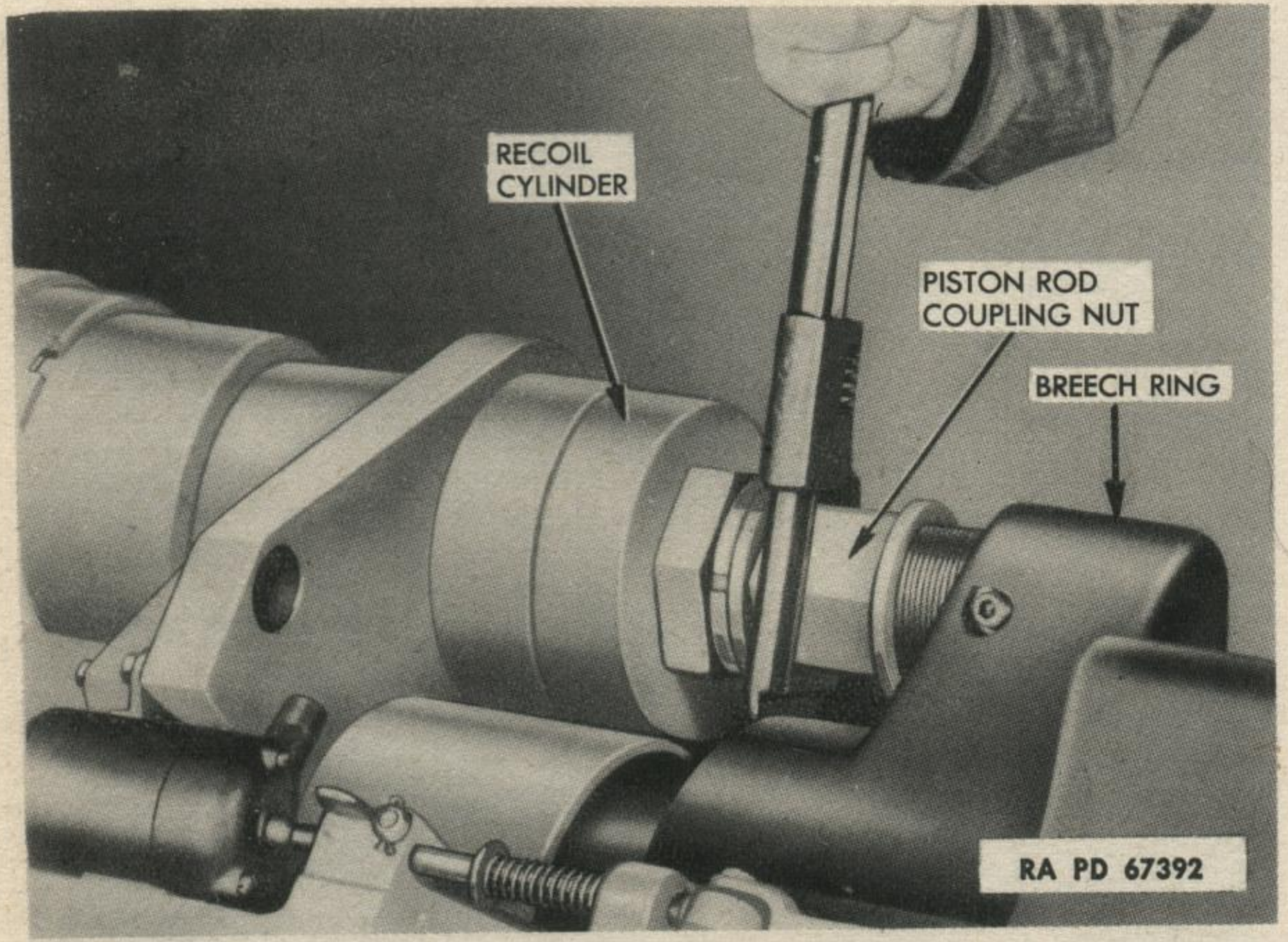


Figure 72 — Unscrewing Piston Rod Coupling Nut

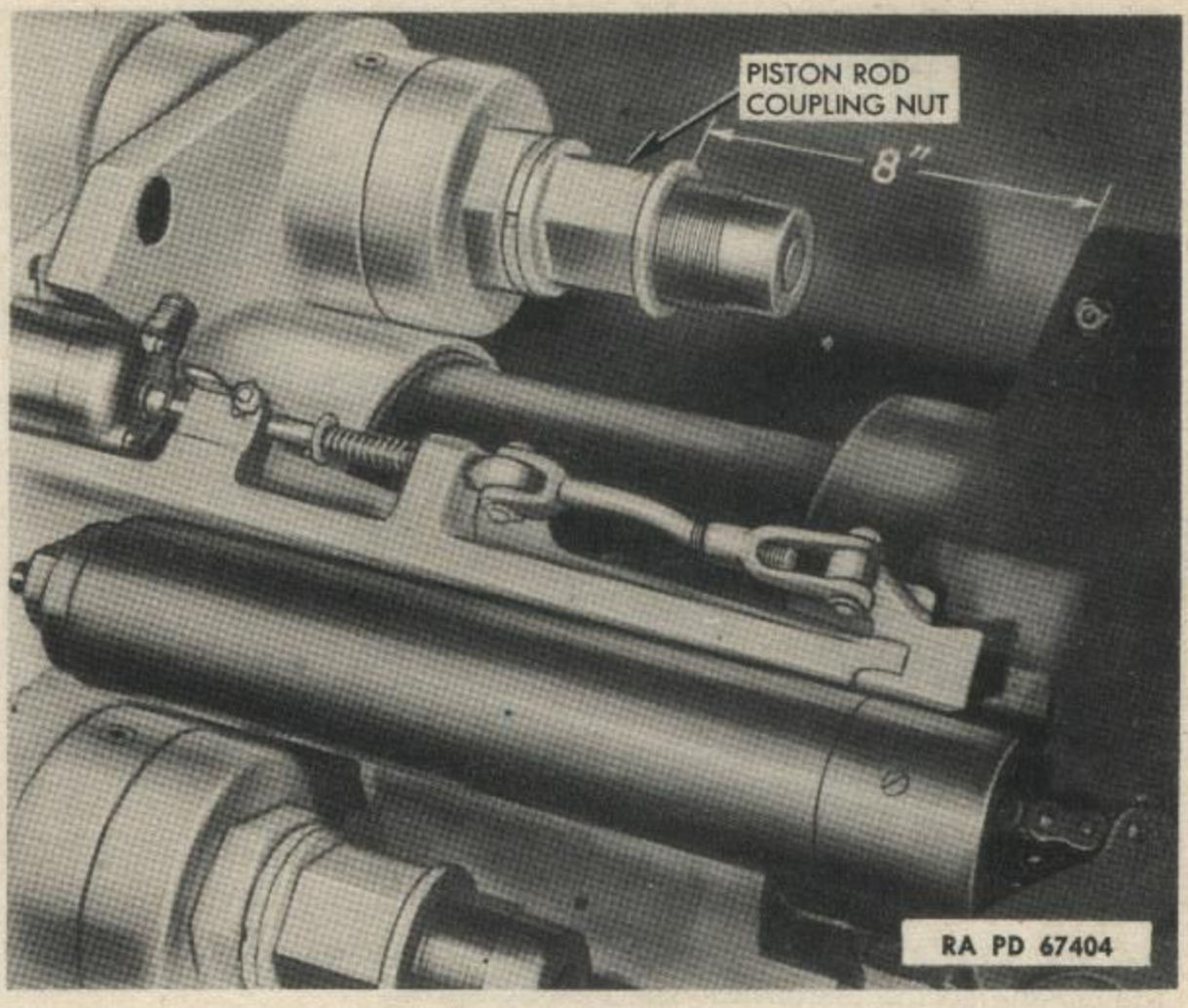


Figure 73 — Breech Ring Disengaged from Piston Rod Coupling Nuts

69. CLOSING SPRING GROUP.

a. Equipment.

EYEBOLT, breechblock lifting A206984
TOOL, breechblock support B163768
TOOL, closing spring retaining
TOOL, operating shaft plunger removing A206983
TOOLS, hand, contained in vehicle tool kit
WRENCHES, for socket head set screws, 1/8-, 1/4-, 5/16-, 3/8-in.

b. Removal.

(1) Remove the breechblock crank as described in paragraph 67 b without withdrawing the spline shaft completely.

(2) With the spline shaft in the chain terminal crank turn the crank slightly to the rear with the operating handle so that the retaining tool can be withdrawn from the hole in the spring piston rod. Release the closing spring tension slowly and remove the spline shaft.

(3) Remove the cotter pin from the front end of the spring piston

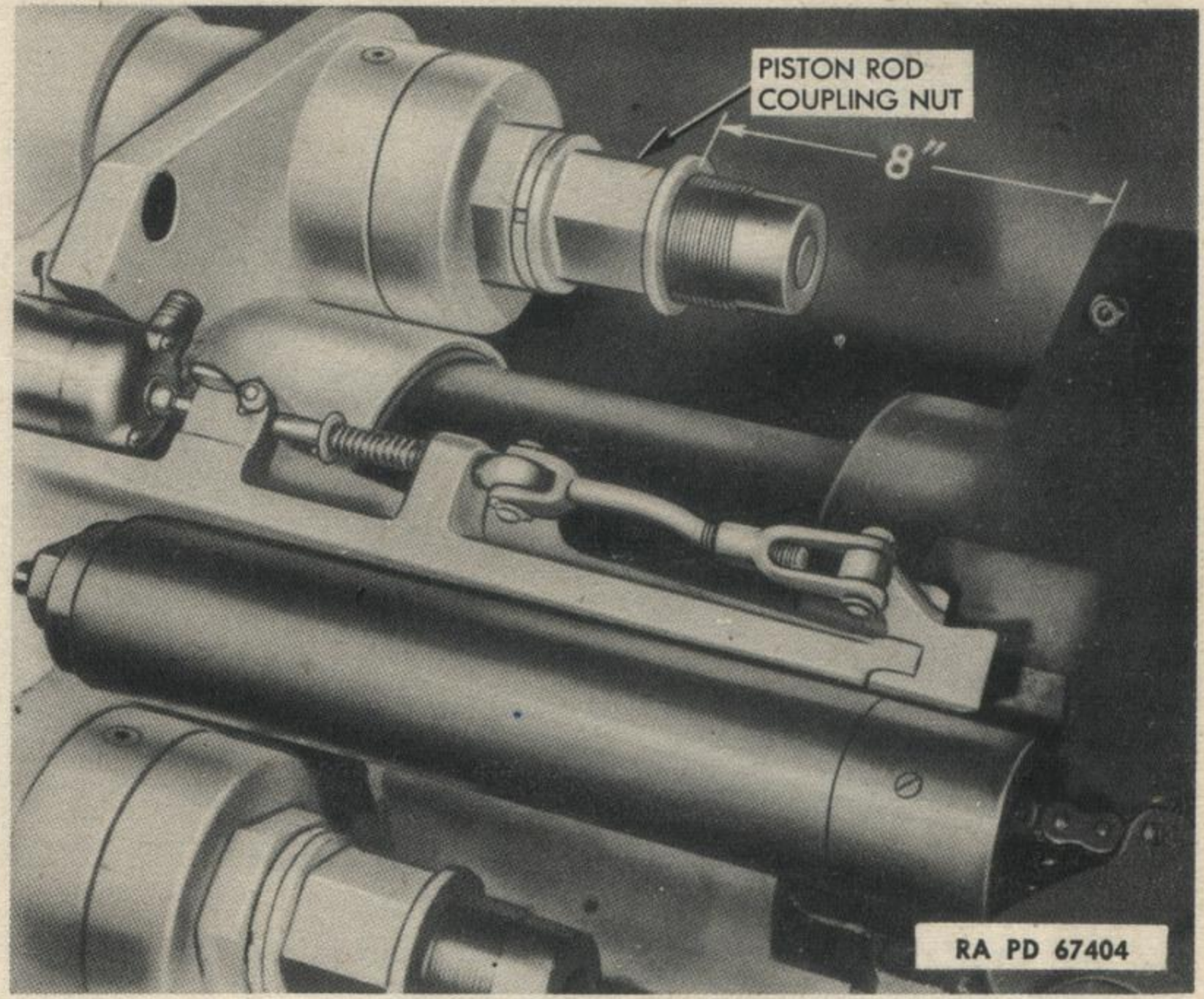


Figure 73 — Breech Ring Disengaged from Piston Rod Coupling Nuts

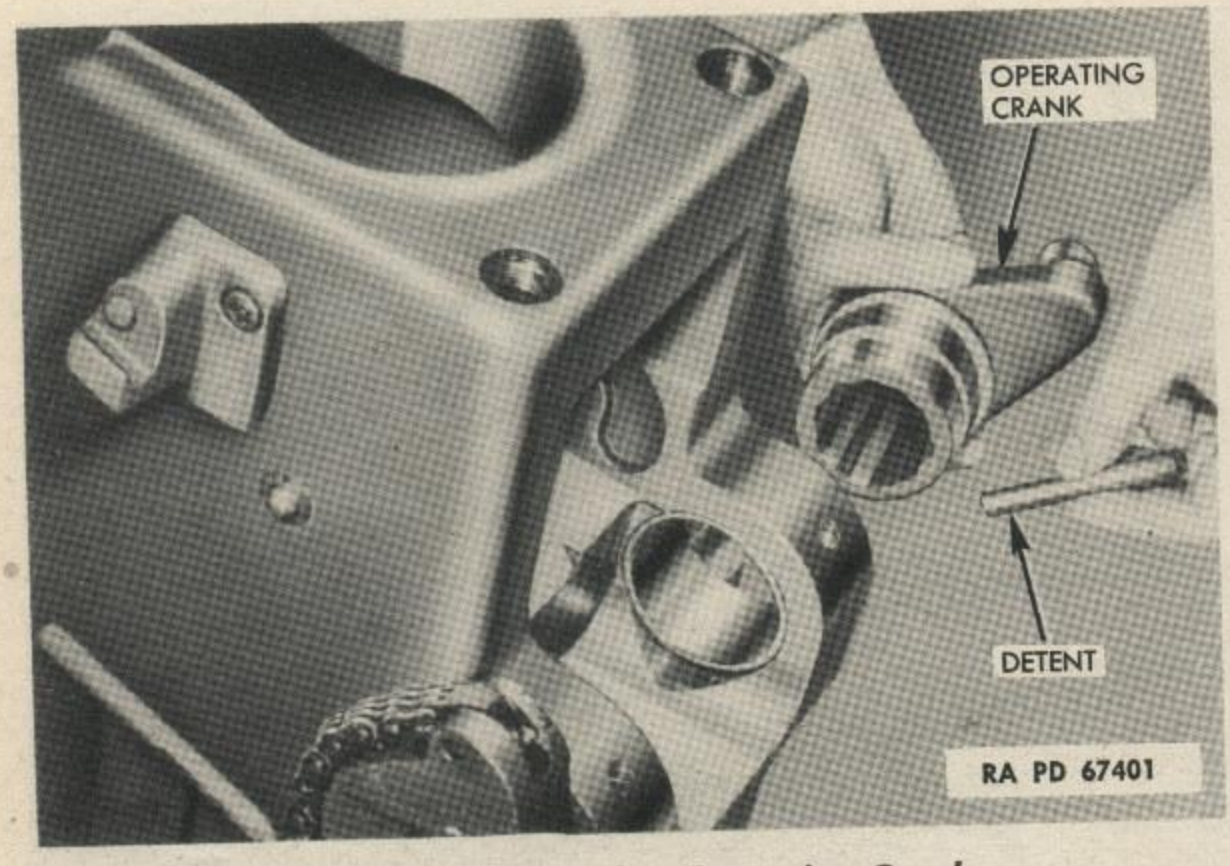


Figure 74 — Removing Operating Crank

rod and with a 1¼-inch wrench remove the piston rod nut. Remove the closing spring piston and the closing spring.

(4) Rotate the chain terminal crank to the rear and remove the chain terminal crank cotter pin and pin. The spring piston rod, chain and chain terminal may now be removed from the rear of the closing spring cylinder.

(5) Remove the closing spring cylinder set screws. The cylinder may now be removed by drawing it toward the muzzle of the gun.

(6) Remove the chain terminal crank detent from the rear lower side of the breech ring. The chain terminal crank is removed by pulling it outward from the breech ring.

c. Disassembly.

The spring piston rod, chain and chain terminal may be disassembled by removing the cotter pins from the crank end link pin and the rod end link pin and removing the pins (fig. 15).

d. Assembly.

Assemble the spring piston rod, chain, and chain terminal by installing the short link pin through the terminal and chain and the long link pin through the spring piston rod and chain. Heads of the pins must be toward the gun. Secure both pins with cotter pins.

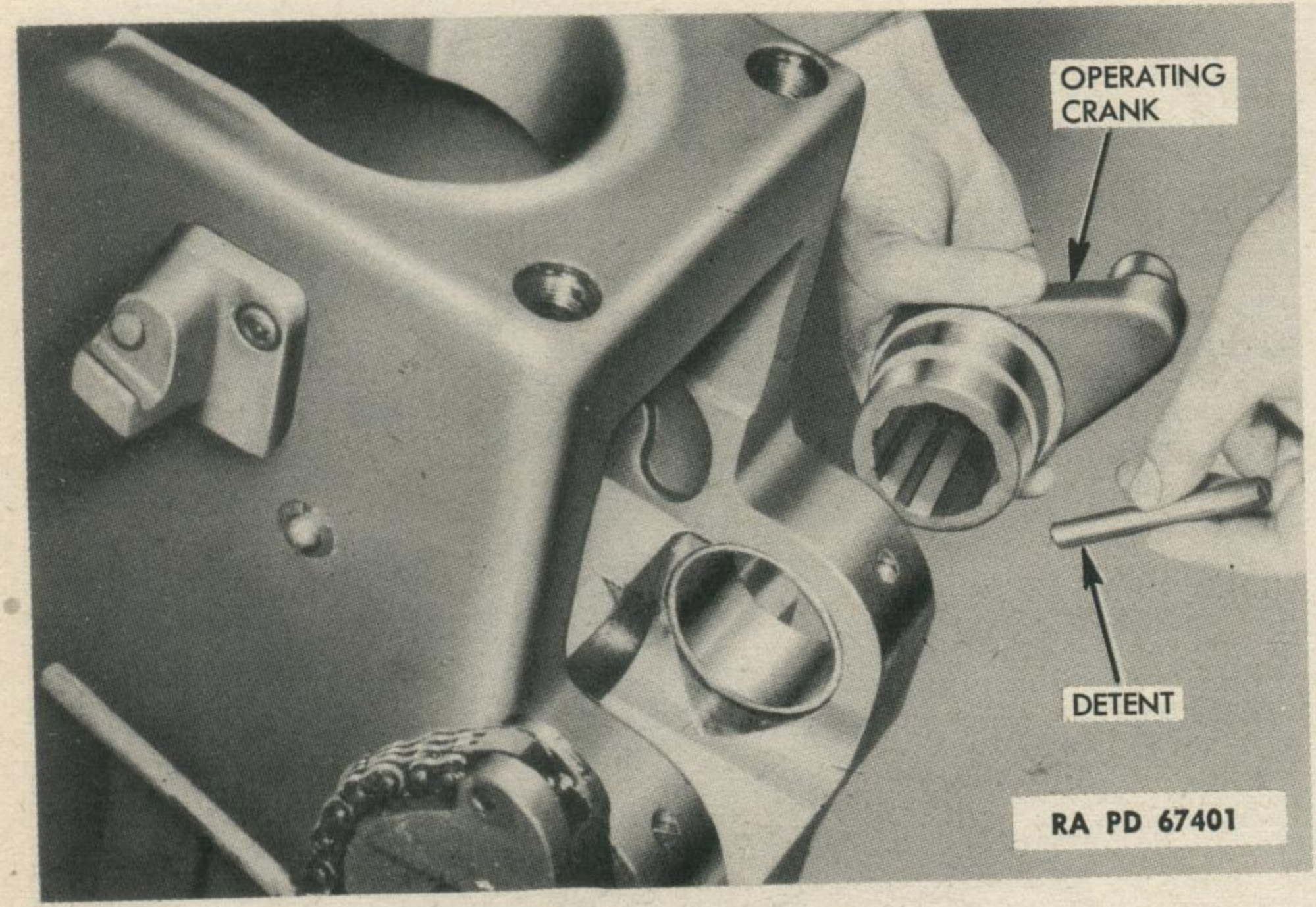


Figure 74 — Removing Operating Crank

c. Installation.

(1) Install the chain terminal crank in the breech ring from the left side and install the chain terminal crank detent.

(2) Install the closing spring cylinder and lock it in place with two closing spring cylinder screws.

(3) Rotate the chain terminal crank toward the rear, install the spring piston rod, chain, and chain terminal in the closing spring cylinder. Connect the terminal to the chain terminal crank with the chain terminal pin. The pin should be installed with the head toward the gun and secured with a 1/8- x 1 3/4-inch cotter pin.

(4) Install closing spring and closing spring piston. Screw the piston rod nut on the spring piston rod until the nut is flush with the end of the rod.

(5) Insert spline shaft assembly through chain terminal crank and with the operating handle, compress the closing spring until the retaining tool can be inserted in the hole in the spring piston rod.

(6) Install breechblock crank and spline shaft and complete the assembly of gun as described in paragraphs 67 and 68.

(7) Adjust piston rod nut until five cotter pin holes are exposed and secure it with a cotter pin in the hole nearest the nut. The final adjustment should be made by trial after operating the gun (fig. 54).

70. BREECH RING AND BREECH RING KEY (fig. 6).

a. Equipment.

TOOLS, hand, as contained in vehicle tool kit

WRENCH, socket head set screw, 3/8-in.

b. Removal.

(1) Remove recoil guard as explained in paragraph 67 b (4).

(2) Elevate gun to horizontal position and unscrew both piston rod coupling nuts from breech ring (figs. 72 and 73).

(3) Slide gun rearward until breech ring key is clear of its slideway in the cradle.

(4) Using socket head set screw wrench remove the two screws securing key to breech ring. Tap key from recess using copper hammer.

NOTE: Removal of breech ring will not be attempted by the using arm. If replacement is necessary notify the proper ordnance personnel who have equipment and facilities to perform this work.

c. Installation.

(1) Install new breech ring key by reversing removal procedure.

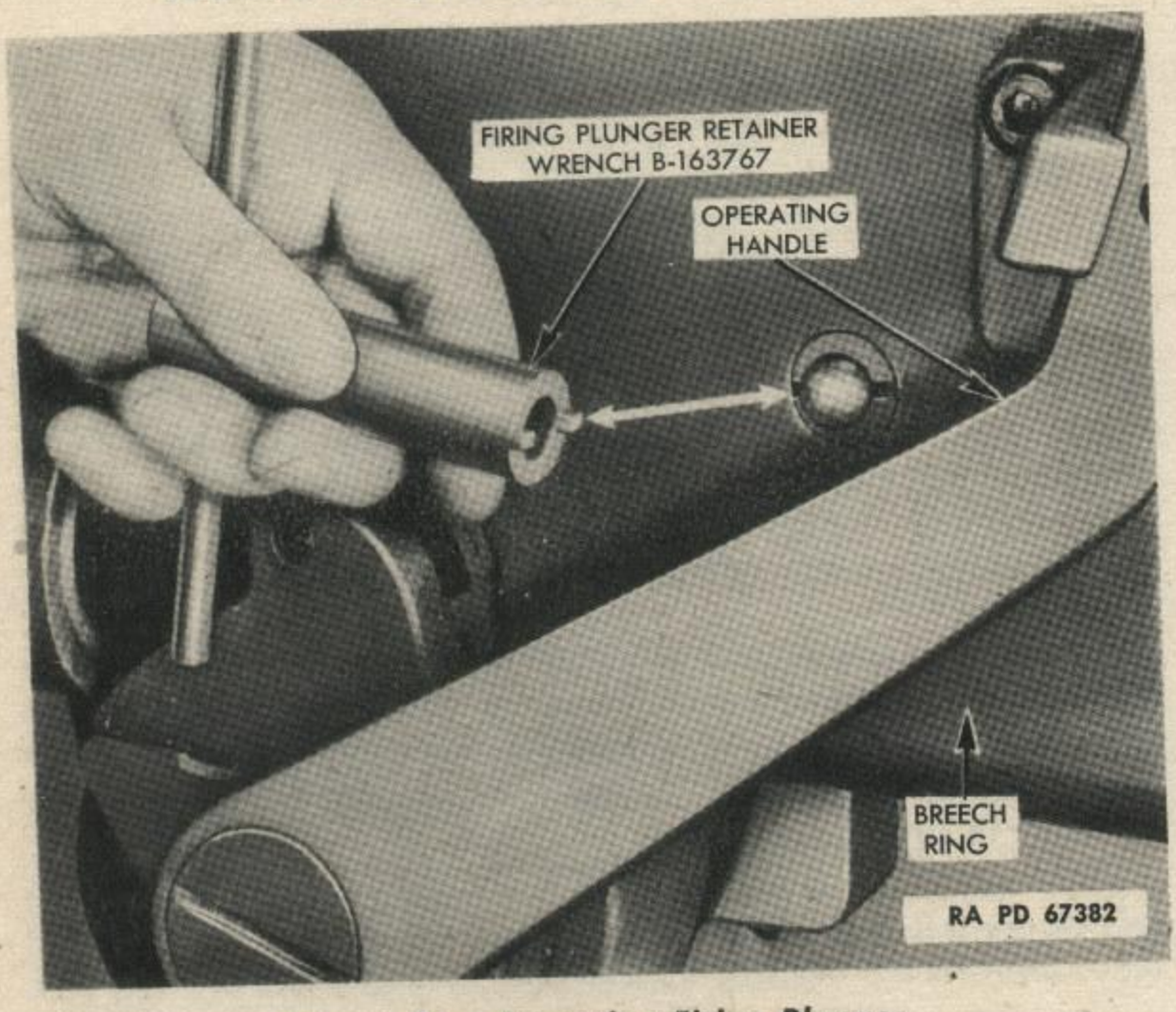


Figure 75 — Removing Firing Plunger

(2) Care should be taken to keep gun elevated at horizontal during any time the piston rod coupling nuts are not screwed into the breech ring. When sliding gun forward, exercise care to prevent damage to coupling nut and breech ring threads. Piston rod coupling nuts must be drawn up evenly and securely.

71. FIRING PLUNGER (fig. 75).

a. Equipment.

TOOLS, hand, as contained in vehicle tool kit

WRENCH, firing plunger retainer B163767

b. Removal.

(1) Remove firing lever bolt and pivot firing lever away from plunger.

(2) Unscrew both piston rod coupling nuts sufficiently to allow firing plunger retainer to clear end of firing lever bracket.

(3) Using wrench B163767 (fig. 75) unscrew retainer and remove firing plunger.

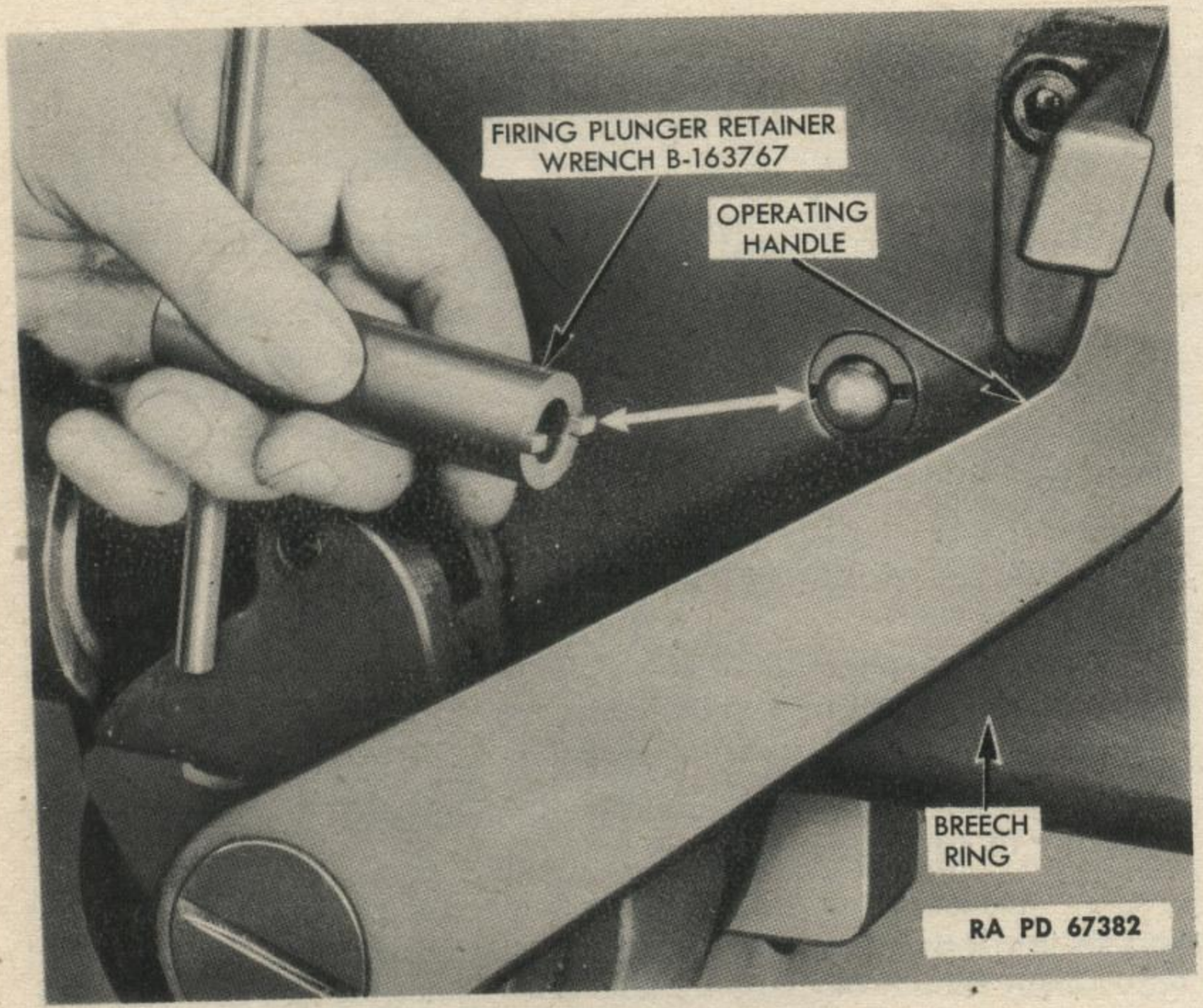


Figure 75 — Removing Firing Plunger

c. Installation.

(1) Reverse removal procedure. Position firing plunger so that short end of plunger will protrude from breech ring and the long end will be toward the breechblock.

(2) Adjust clearance between firing plunger and firing lever as covered in paragraph 56 **b** (1) (figs. 56 and 57).

72. CAL. .50 A.A. MACHINE GUN M2 (fig. 32).

a. Dismounting Gun.

(1) Remove the front and rear fastening pins attaching gun to cradle and lift gun from cradle (fig. 32).

b. Disassembly and Assembly.

(1) Refer to FM 23-65 and TM 9-1226 for information on the cal. .50 Browning Machine Gun M2.

(2) To head space the cal. .50 heavy barrel, M2 Gun, screw barrel by hand into barrel extension until it comes in contact with bolt. Check, to make sure end of barrel extends through barrel extension. Then unscrew barrel two notches. If gun operates sluggishly unscrew barrel one additional notch.

c. Mounting Gun.

(1) Place gun in position on cradle and install front and rear fastening pins.

d. Removing Cradle and Support from Ring.

(1) Dismount gun.

(2) Remove both support pastening pins and both nuts and studs attaching support to ring bracket (fig. 32).

e. Removing Cradle from Support.

(1) Dismount gun.

(2) Unhook balance springs and remove both nuts and A.A. gun pivot studs.

f. The ammunition box may be removed from the cradle by removing the attaching screws and nuts.

g. Assembling Cradle and Support.

Reverse above procedure to assemble and install cradle and support.

Section X

DISASSEMBLY AND ASSEMBLY OF MOUNT IN TURRET

	Paragraph
General	73
Tools	74
Firing mechanism	75
Elevating mechanism	76
Ejector cam	77
Periscope drag link	78
Gun shield	79
Cal. .50 A.A. gun turret ring	80

73. GENERAL.

a. This section covers maintenance operations which can be performed with the 76-mm gun and mount in the turret. The using arms will not attempt the removal of the 76-mm gun or mount from the turret.

b. After removal and disassembly all parts should be cleaned thoroughly and inspected for conditions that will affect their proper functioning. Inspect for wear, scoring, corrosion, pitting, burs, rust, cracks, misalinement, binding and general appearance. Recondition parts if possible by hand stoning, cleaning up threads, correcting alinement and relieving binding conditions. Parts which cannot be satisfactorily reconditioned should be replaced.

74. TOOLS.

a. The tools necessary to service the 76-mm gun and mount are listed, described and illustrated in section XI.

75. FIRING MECHANISM.

a. Equipment.

TOOLS, hand, as contained in vehicle tool kit

b. Disassembly.

(1) Remove cotter pin and rod end pin from firing lever and rod end yoke (fig. 27).

(2) Remove firing shaft return spring cotter pin.

(3) Put firing shaft release lever in firing position (fig. 45).

(4) Slide firing shaft rearward far enough to remove the firing shaft return spring and two washers.

(5) Remove firing shaft and firing lever rod (fig. 27).

(6) Drift out release lever shaft collar retaining pin and remove collar, and release shaft and lever assembly. CAUTION: When removing shaft assembly use care not to lose ball and spring.

(7) Remove release lever shaft ball and spring.

(8) Remove firing lever bolt and firing lever (fig. 27).

(9) Disassemble firing shaft from firing lever rod by removing cotter pin and rod end pin.

(10) Unscrew rod end yoke from firing lever rod.

(11) Drift out firing shaft release lever retaining pin and remove lever.

(12) Remove cotter pin and loosen firing cable clamp bolt at solenoid, and withdraw firing cable from solenoid (fig. 27).

(13) Remove solenoid by removing locking wire and three attaching cap screws.

(14) Remove locking wire and three solenoid end cap attaching screws.

(15) Remove solenoid end cap and remove wires from terminal posts.

(16) Unscrew the nut which locks the hand firing rod in the hand firing lever swivel.

(17) Unscrew the hand firing rod from the swivel and remove the swivel and rod.

(18) Remove the attaching hand firing lever stud nut and lock washer and remove the hand firing lever and hand firing lever spring. Unscrew the hand firing lever stud from the cradle.

(19) Remove firing pedal and switch.

c. Assembly.

(1) Assemble firing mechanism by reversing step-by-step disassembly procedure.

(2) Lubricate all parts as they are assembled with specified lubricant.

(3) Bend ends of cotter pins down close.

(4) When installing firing shaft be sure notch for release lever shaft alines with its hole in mount bracket.

(5) Adjust length of firing lever rod by screwing rod end to

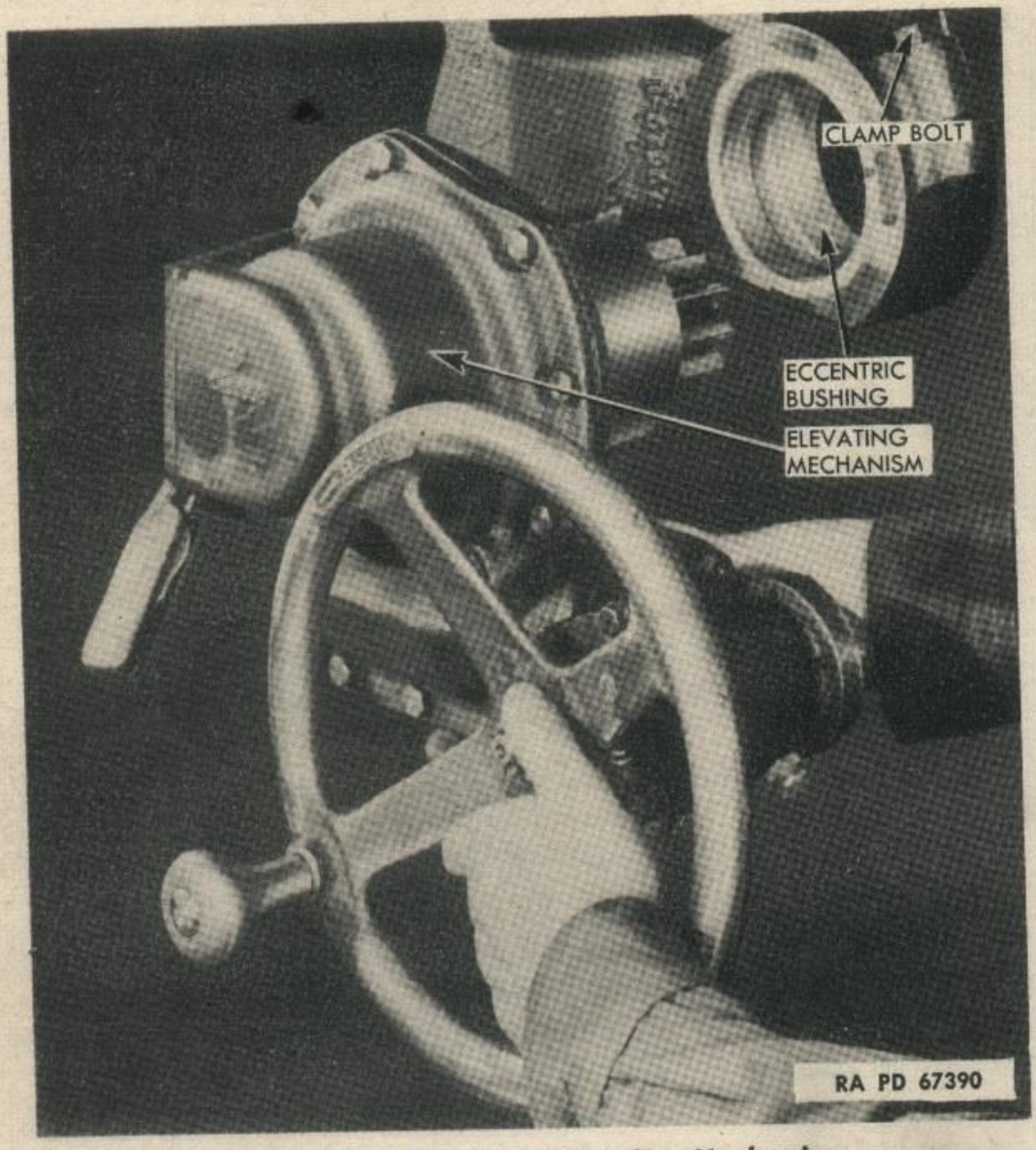


Figure 76 — Removing Elevating Mechanism

position to give approximately $\frac{1}{32}$ of an inch clearance between end of firing plunger and contact surface of firing lever. Refer to section VII for adjustment procedure.

76. ELEVATING MECHANISM (fig. 26).

a. Equipment.

TOOLS, hand, as contained in vehicle tool kit

b. Removal.

(1) Place gun tube in a depressed position resting on a wooden block or suitable pad, supported on vehicle hull, and lock the turret ring gear (fig. 37).

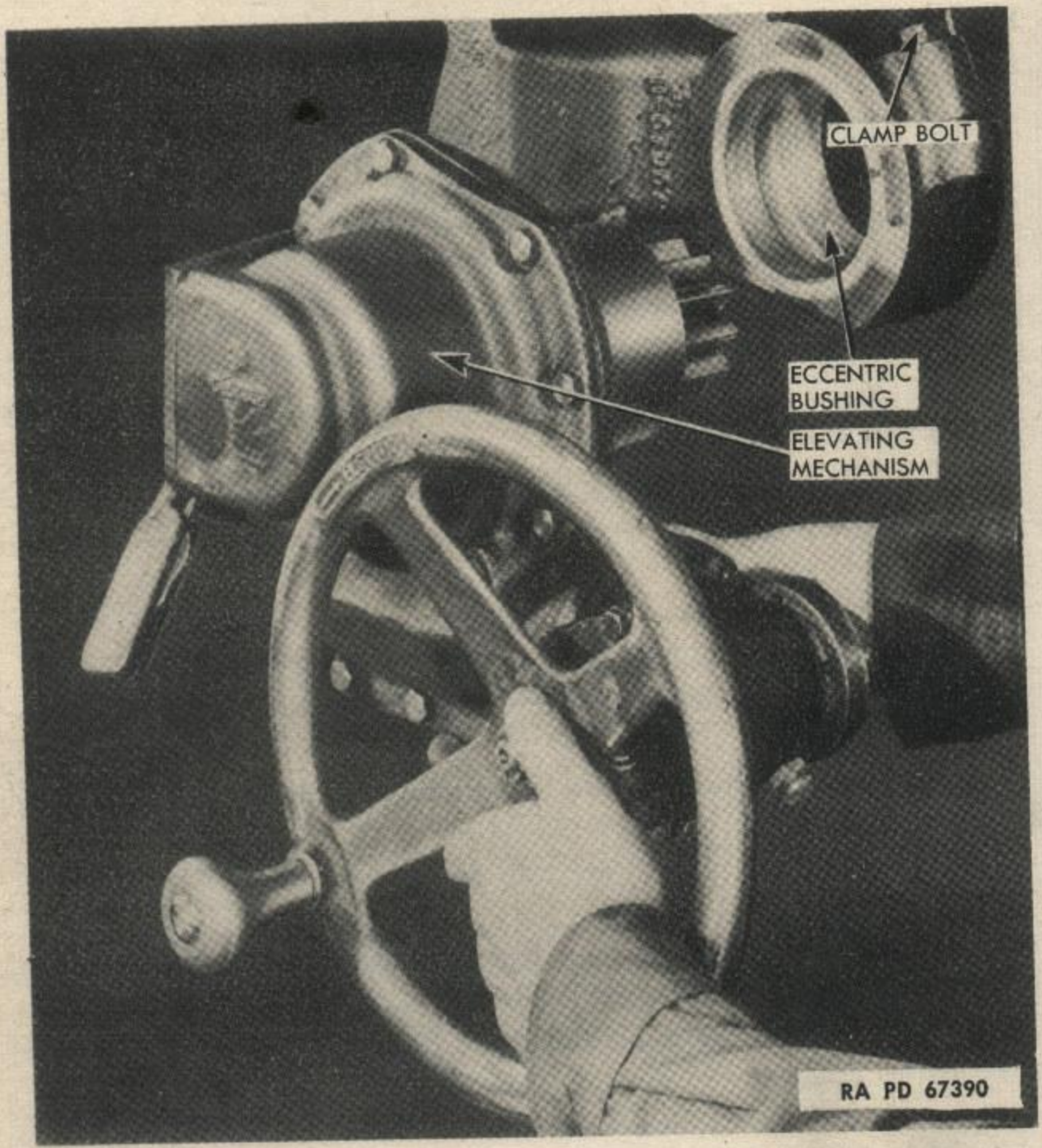


Figure 76 — Removing Elevating Mechanism

DISASSEMBLY AND ASSEMBLY OF MOUNT IN TURRET

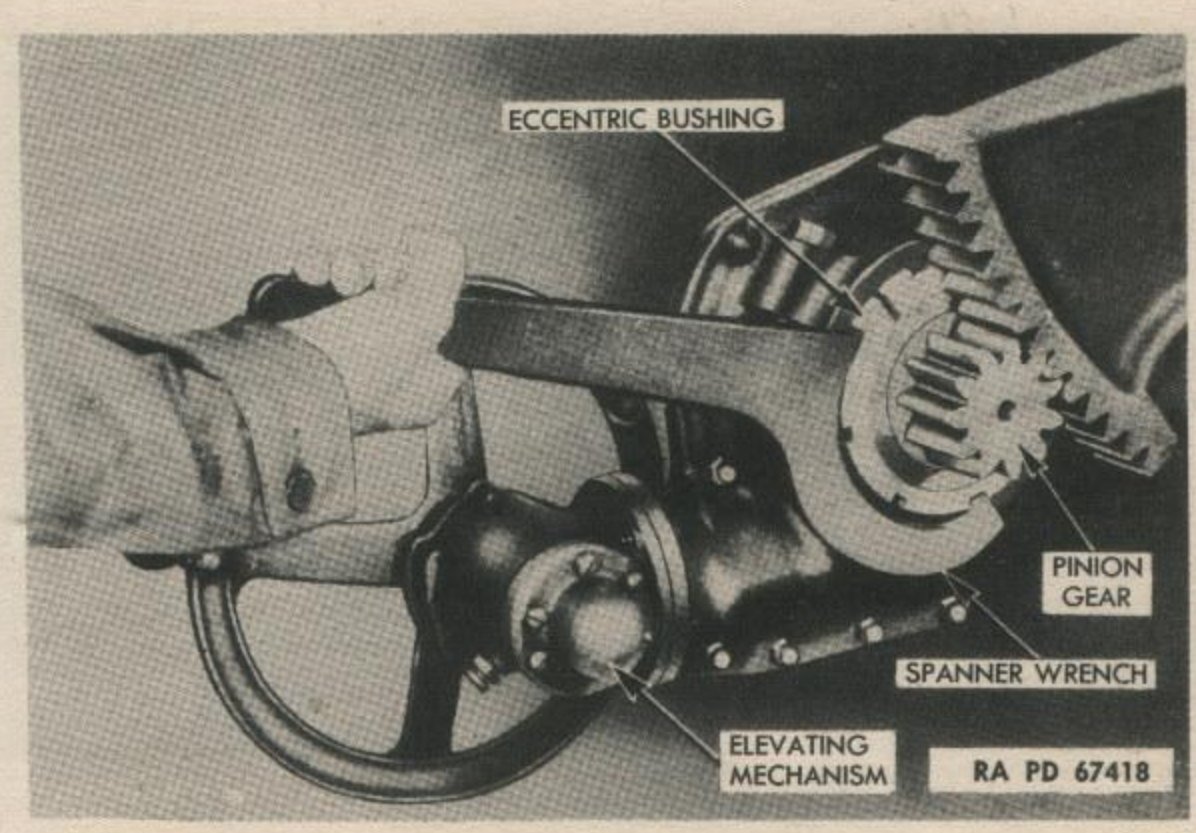


Figure 77 — Adjusting Elevating Mechanism Eccentric Bushing

(2) Place elevating shifter lever in the disengaged position which is toward the right (fig. 41).

(3) Remove elevating mechanism lock screw and washer at bottom of elevating mechanism bracket.

(4) Loosen clamp bolt at top of the elevating mechanism bracket.

(5) Slide elevating mechanism toward the left, and remove (fig. 76).

(6) The elevating rack may be removed by removing the locking wire and unscrewing the four cap screws which attach it to the rotor.

(7) Remove the elevating mechanism bracket by removing the locking wire and the two upper attaching screws, the safety nuts from the two lower studs and sliding the bracket rearward clear of the studs.

c. Disassembly.

(1) With elevating mechanism removed from its support bracket and elevating rack removed from the rotor, the eccentric bushing (fig. 26) may be removed by loosening the locking screw and sliding the bushing toward the right.

(2) Remove key from elevating rack by tapping it out of its keyway. Use a brass punch or copper hammer.

(3) Disassembly of elevating mechanism housing will not be

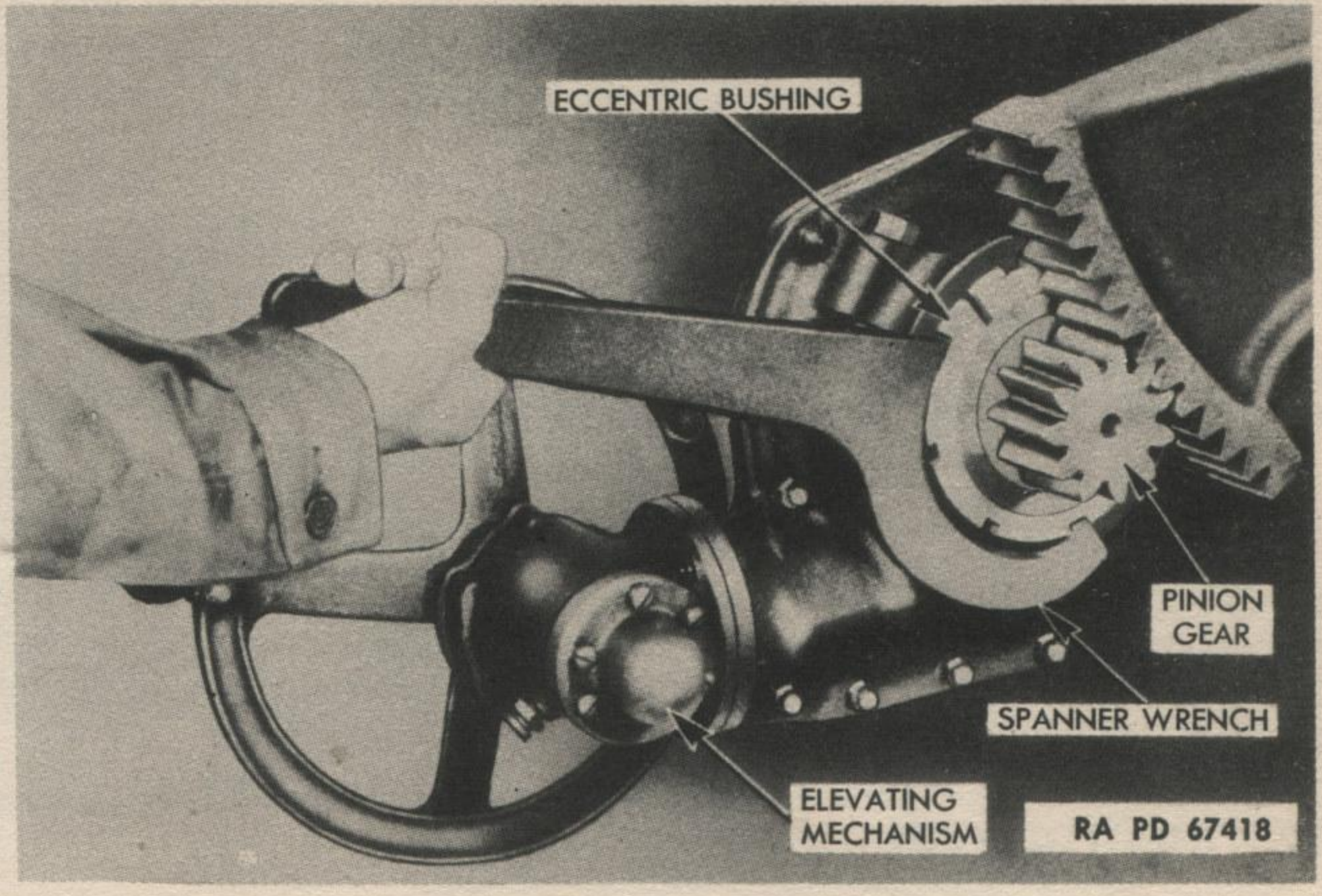


Figure 77 — Adjusting Elevating Mechanism Eccentric Bushing

attempted by using arms. Repairs requiring this disassembly will be reported to ordnance personnel having proper equipment and facilities.

d. Assembly and Installation.

(1) Reverse the removal procedure.

(2) When installing eccentric bushing, position it with the slot provided to accommodate the locking screw at the bottom and with the flanged end of the bushing on the right side of the bracket.

e. Adjustment.

(1) Adjust lash between elevating rack and pinion shaft gear by turning the eccentric bushing with a spanner wrench (fig. 77). The lash should be at a minimum without causing the gears to bind. Maximum allowable lash is ¾ inch as measured at the rim of the handwheel.

77. EJECTOR CAM.

a. Equipment.

TOOLS, hand, as contained in vehicle tool kit.

b. Disassembly.

(1) Remove ejector cam return spring by compressing the spring retainers and sliding forward clear of ejector cam retainer seat.

(2) Remove two ejector cam pivot pin set screws (fig. 28).

(3) Drift ejector cam pivot pin out (either way) and remove ejector cam.

c. Assembly.

(1) Assembly is in the reverse order of disassembly.

78. PERISCOPE DRAG LINK.

a. Equipment.

TOOLS, hand, as contained in vehicle tool kit.

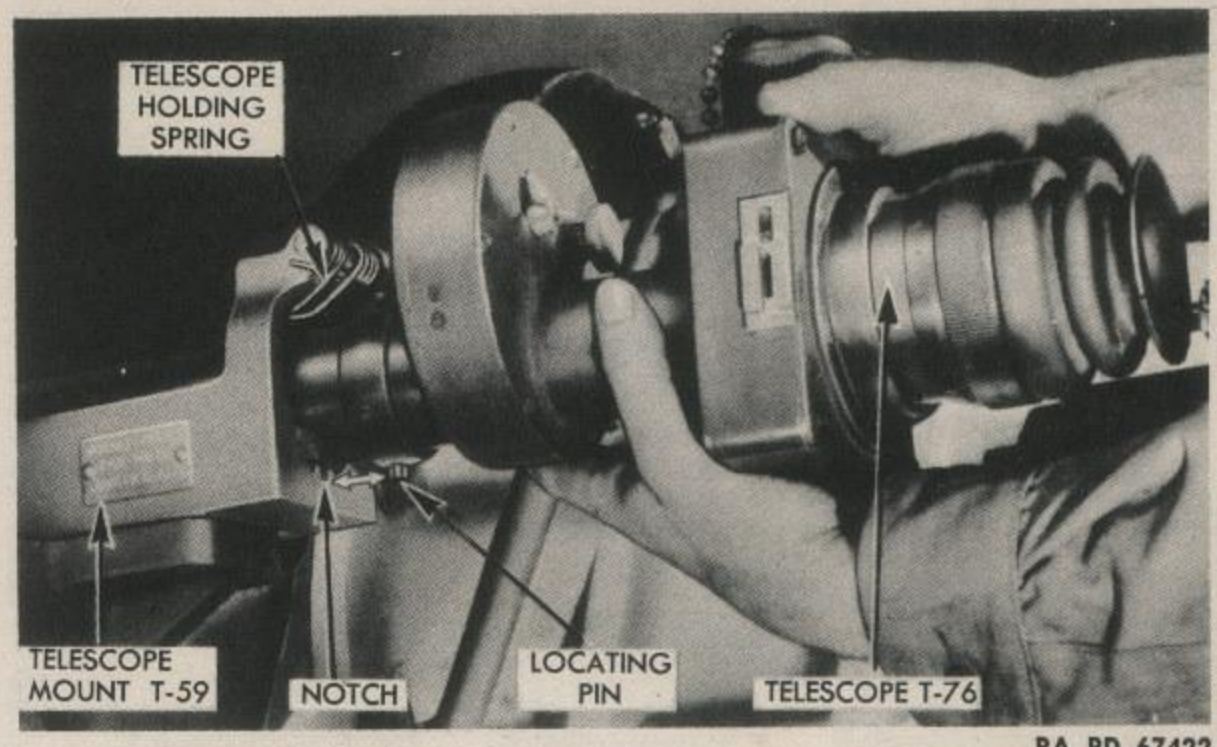
b. Removal.

(1) Apply wrench to flats of lower connector stud and unscrew stud from its bracket on the rotor (fig. 31).

(2) Remove cap screws which attach upper connector bracket to periscope holder.

c. Disassembly.

(1) Remove upper and lower connectors from drag link by loosen-



RA PD 67422

Figure 78 — Removing Direct Sighting Telescope

ing the jam nuts and unscrewing the connectors. NOTE: A flat is provided on the drag link rod for application of a wrench when removing the connectors or adjusting the length of the drag link.

(2) To simplify the reassembly and adjustment, measure the distance between connectors before disassembly (fig. 31) and reassemble with same measurement. When this measurement is not possible due to badly bent or broken parts, screw the connectors on the rod until the distance between them is 10⅛ inches. For final adjustment, see paragraph 86 b (1).

(3) Remove periscope bracket from upper connector bearing stud by removing the lock nut and the eccentric nut from the bearing stud.

(4) Remove upper bearing stud from bearing by removing lock nut and washer and pressing stud from bearing.

(5) Remove snap ring from upper connector and press bearing from connector.

(6) Follow the above procedure for removal of lower connector bearing and stud.

d. Assembly and Installation.

Reverse the disassembly and removal procedure.

79. GUN SHIELD.

a. Equipment.

TOOLS, hand, as contained in vehicle tool kit.

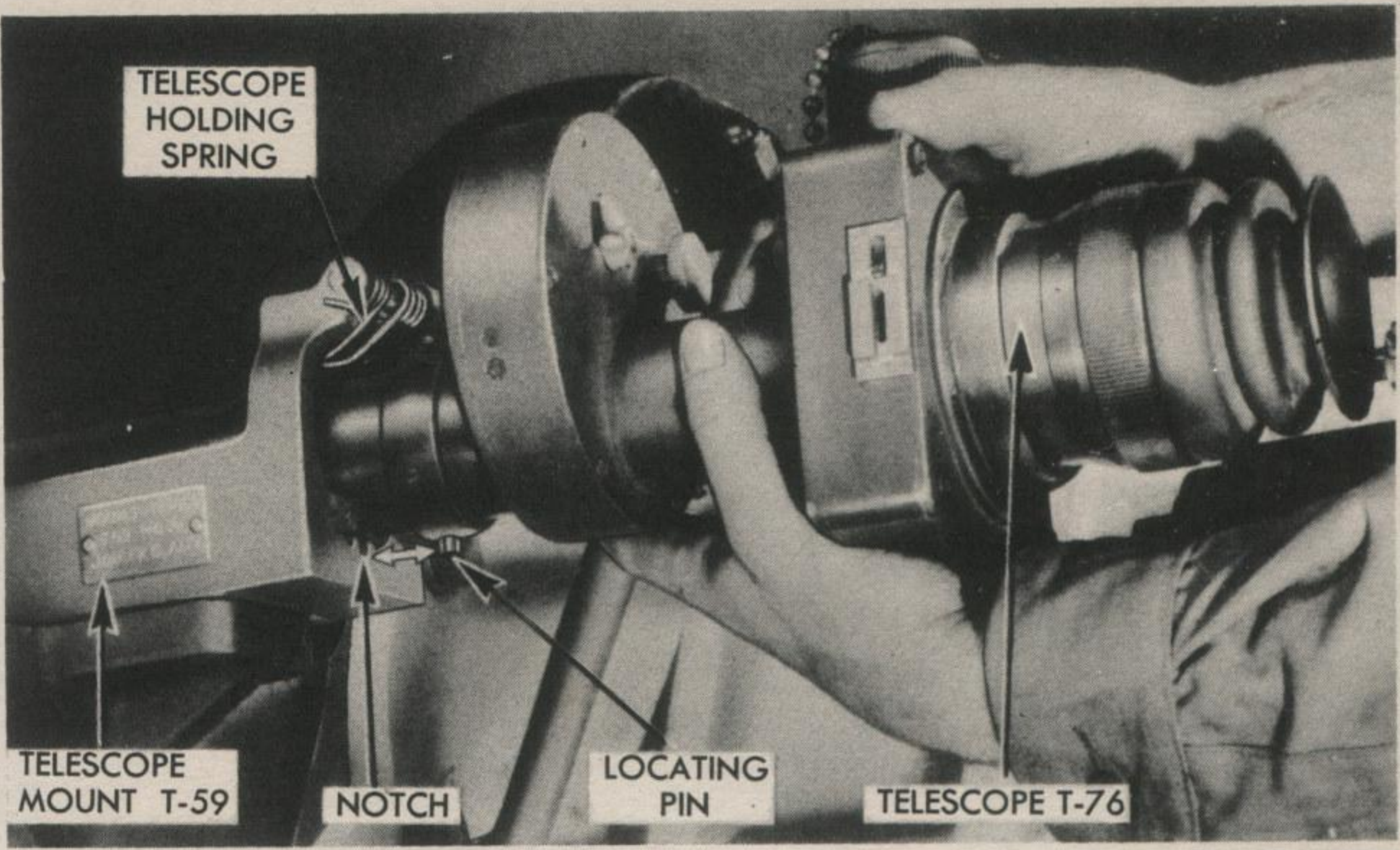


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Figure 78 — Removing Direct Sighting Telescope

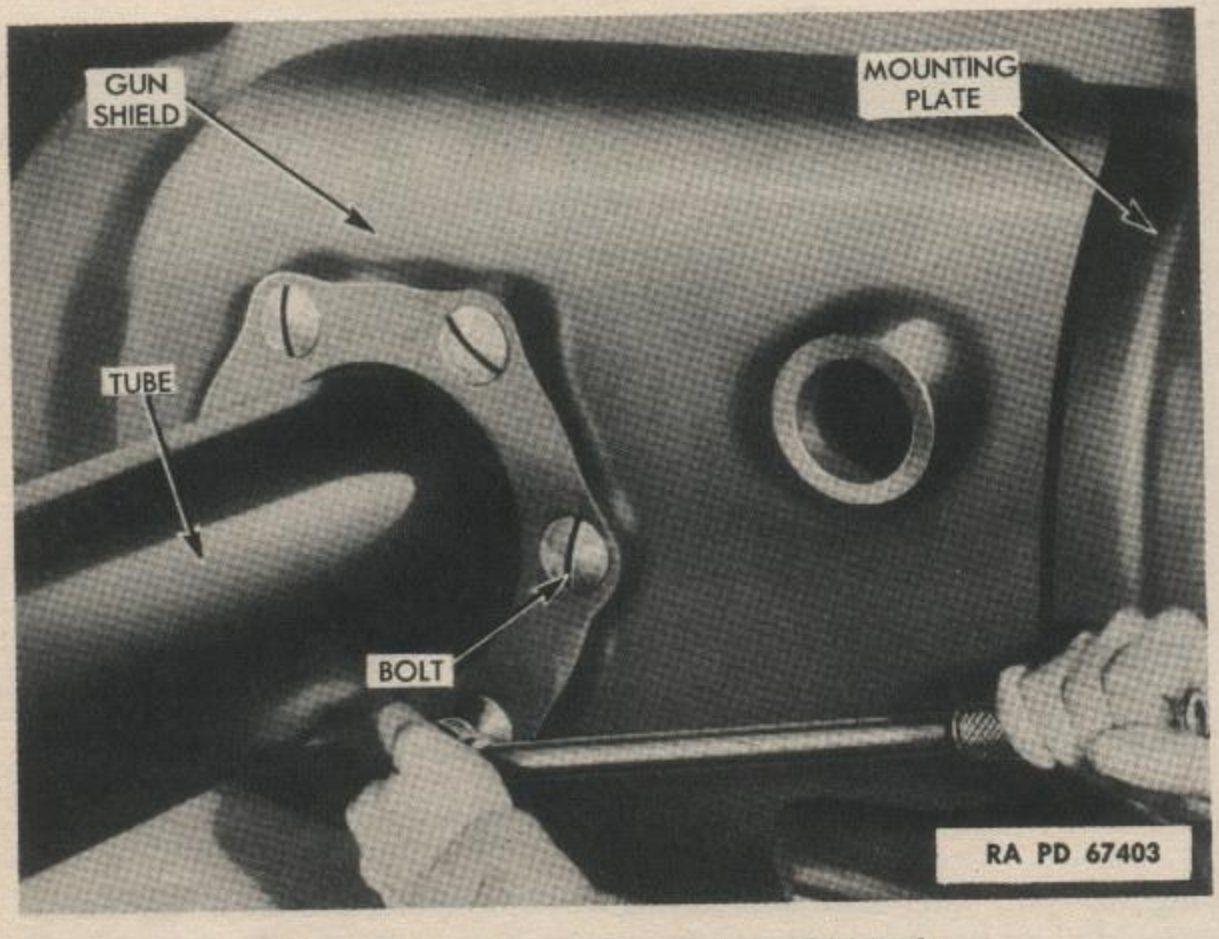

Figure 79 — Removing Gun Shield Bolts

b. Removal.

(1) Remove the direct sighting telescope from the mount, thus removing the front end of the telescope from the hole in the gun shield and preventing any chance of damaging the telescope while removing the gun shield.

(2) Remove the six gun shield bolts from the gun cradle rotor. CAUTION: Support the shield on either side to prevent damaging the bolt threads. (fig. 79).

(3) Slide the shield out to the end of the gun tube, supporting it properly to prevent scraping the paint off the gun tube, and remove the shield. (fig. 80).

c. Installation.

Reverse the removal procedure to install the gun shield onto the mount. Support shield until the shield bolts are guided into the tapped holes in the gun cradle rotor, to prevent jamming the threads.

80. CAL. .50 A.A. GUN TURRET RING.

a. Equipment.

TOOLS, hand, as contained in vehicle tool kit.

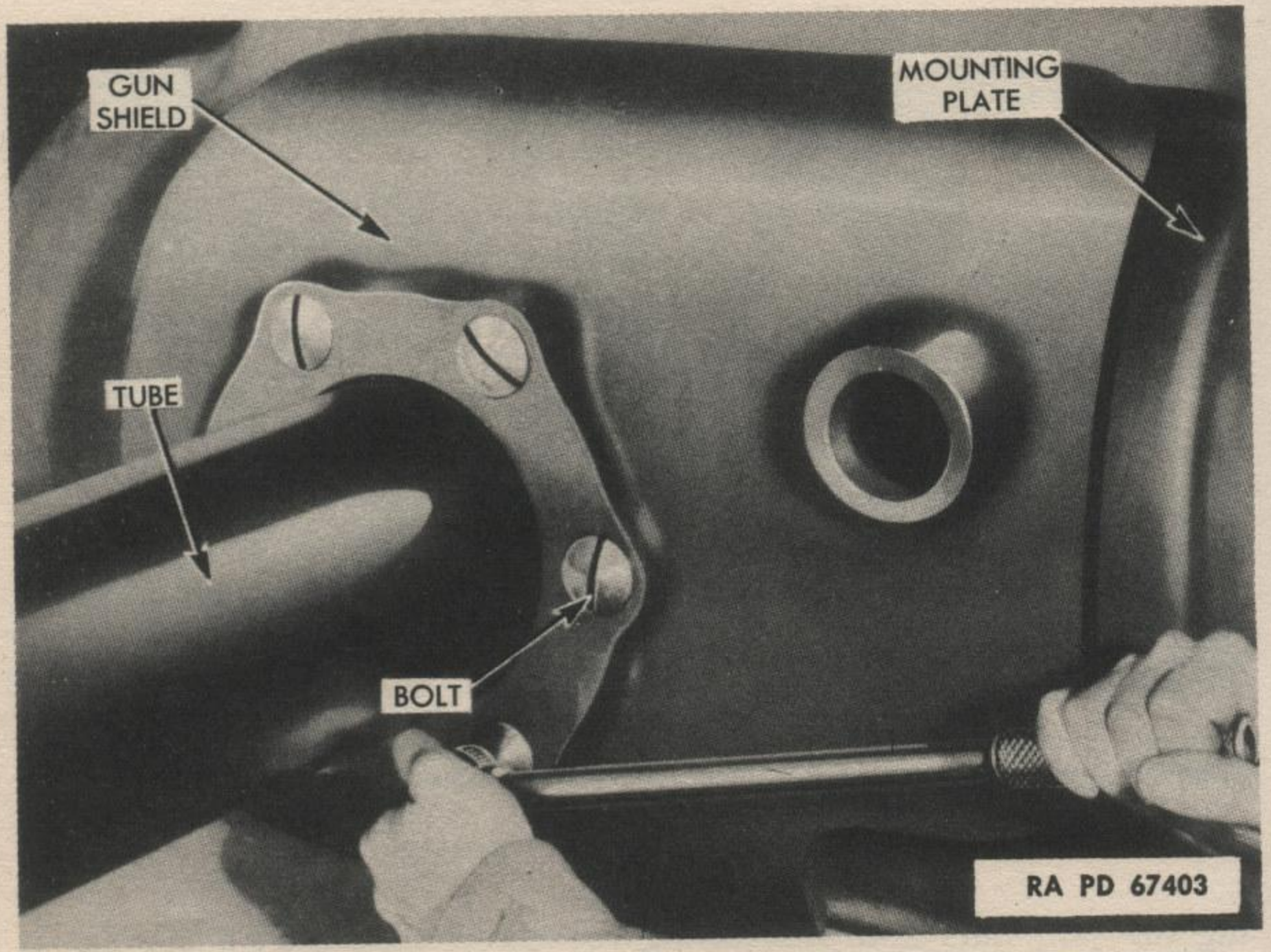

Figure 79 — Removing Gun Shield Bolts

DISASSEMBLY AND ASSEMBLY OF MOUNT IN TURRET

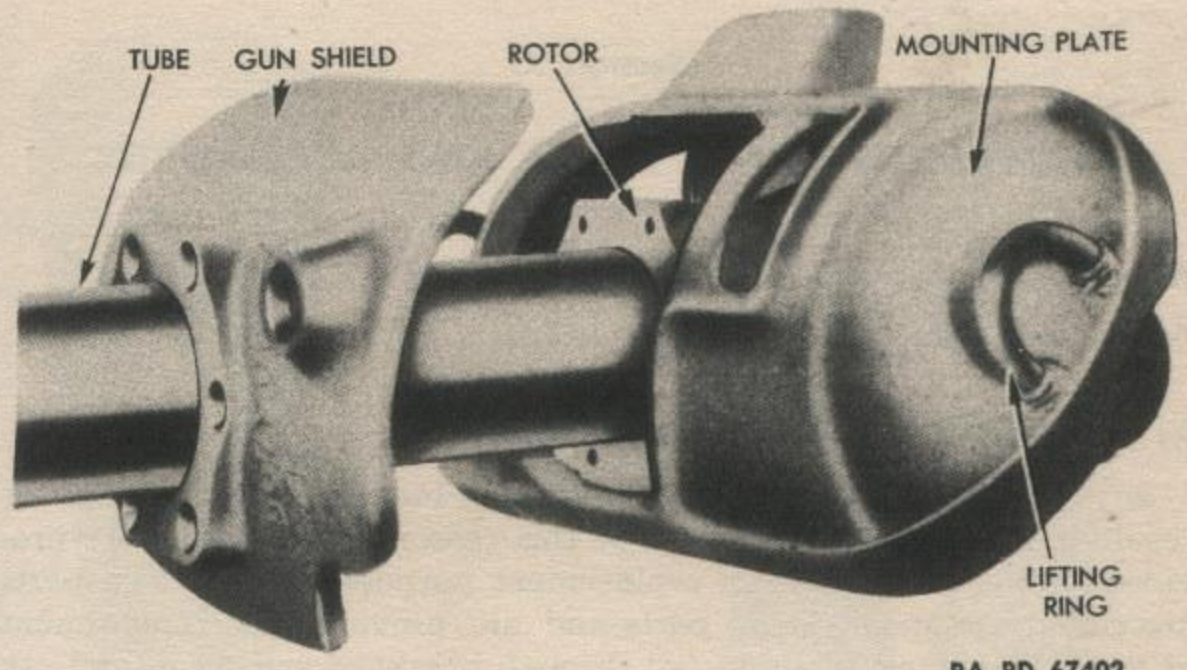

Figure 80 — Removing Gun Shield

b. Disassembly.

(1) Remove front and rear A.A. gun front and rear fastening pins, and lift the cal. .50 gun from the cradle.

(2) Set the cradle latch in the released position and remove the cotter pins, nuts, and bolts which attach the cradle to the gun support. Remove the balance spring and cradle.

(3) Remove the gun support pivot studs and the support fastening pins.

(4) Remove the gun support.

(5) Remove mounting brake assembly.

(6) Remove all but two opposite cap screws from the lower inner ring.

(7) Support the lower ring by blocks and remove the two remaining screws.

(8) Lift the inner top ring out of the mount.

(9) If the lower ring is damaged, remove the bearings and ease the lower ring out of the bearing ring.

(10) Should it be necessary to remove the bearing ring, remove the attaching screws from the ring supports and turret wall and remove.

c. Assembly.

Assemble in the reverse order of disassembly. NOTE: In assembly, tighten the ring screws gradually so that the ring will be seated evenly.

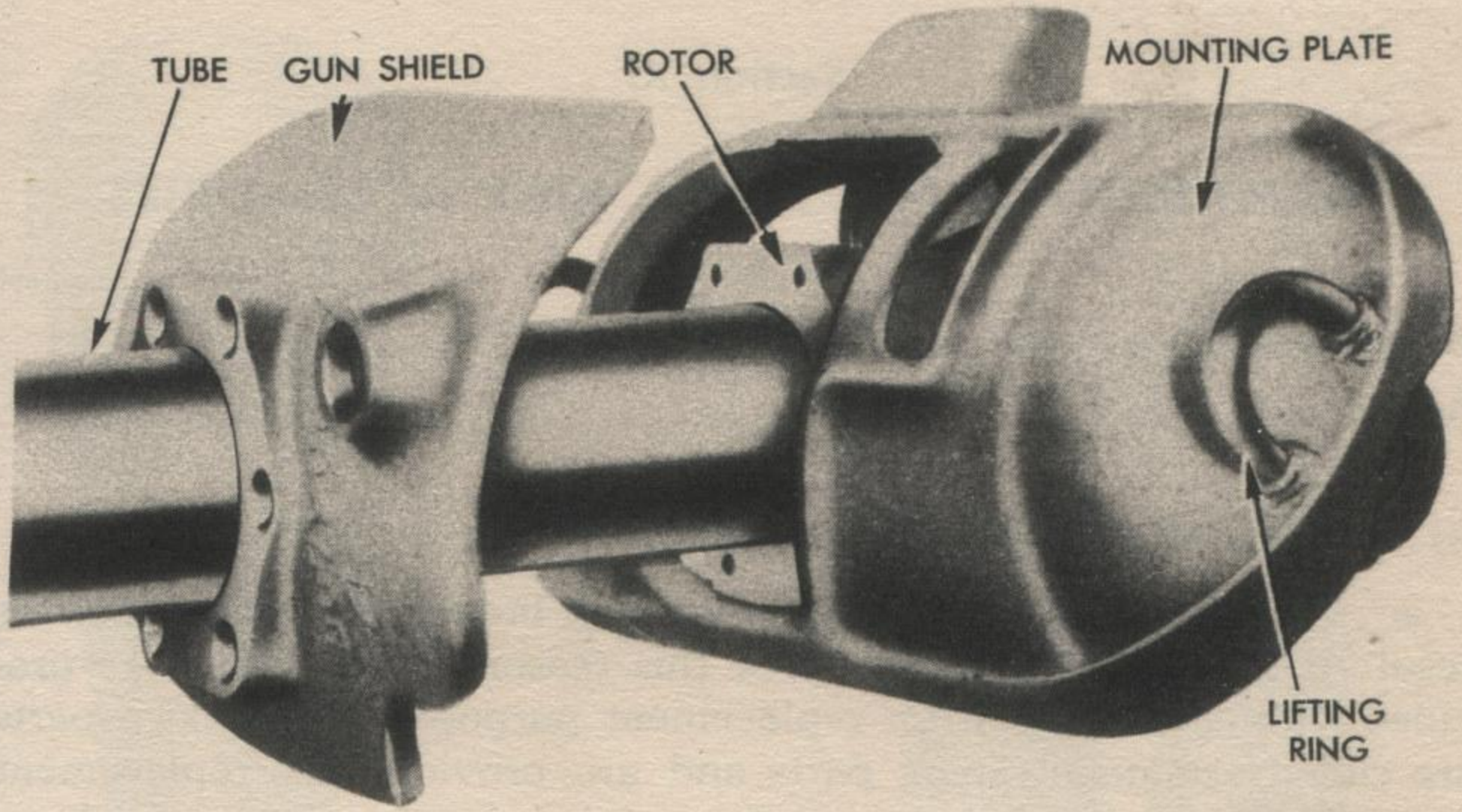

Figure 80 — Removing Gun Shield

Section XI

ARMAMENT SPARE PARTS AND ACCESSORIES

	Paragraph
Armament spare parts	81
Accessories	82

81. ARMAMENT SPARE PARTS.

a. Parts become unserviceable through breakage or through wear resulting from continuous use. For this reason certain parts are provided with each weapon for replacement purposes. These extra parts are called armament spare parts and are provided for replacement of those parts most likely to fail through breakage and wear, and are for use by the using arms in making minor repairs. Sets of spare parts should be kept complete at all times by requisitioning new parts for those used. For listing of armament spare parts see SNL G-163 "Organizational Spare Parts and Equipment" section.

b. Care of spare parts is covered in the section of this manual entitled "Care and Preservation".

82. ACCESSORIES (figs. 81 and 82).

a. General. Accessories include the tools and equipment required for disassembling and assembling, and for cleaning and preserving the 76-mm Gun M1 and cal. .50 Machine Gun M2, HB. Accessories should not be used for purposes other than those prescribed, and when not in use, should be stored in the places or receptacles provided. There are a number of accessories, the names or general characteristics of which indicate their uses. Others embodying special features or having special uses are described in the following paragraphs.

b. Accessories for 76-mm Gun.

Item	Stowage Position
BAG, empty cartridge	On gun mount
BOOK, Arty. Gun, O.O. Form 5825	Behind gunner's seat
BOOK, Technical Manual 9-308	Back of driver's seat
BRUSH, bore, M15	Rear turret box
CAN, oil, 1 qt	Holder, left front air duct
COVER, bore brush, M516	On brush
COVER, breech	On gun

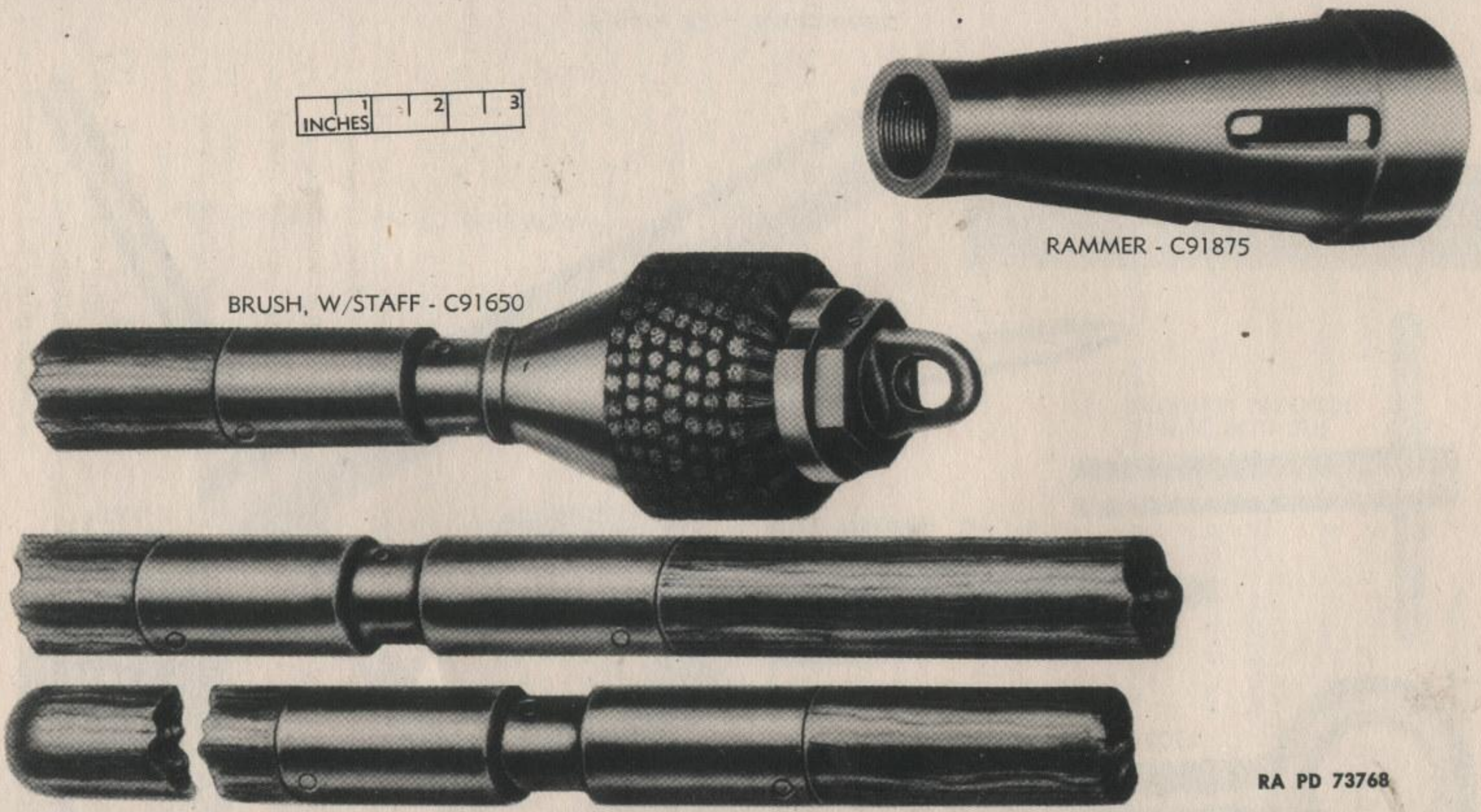

Figure 81 — Accessories for Gun, 76-mm, M1

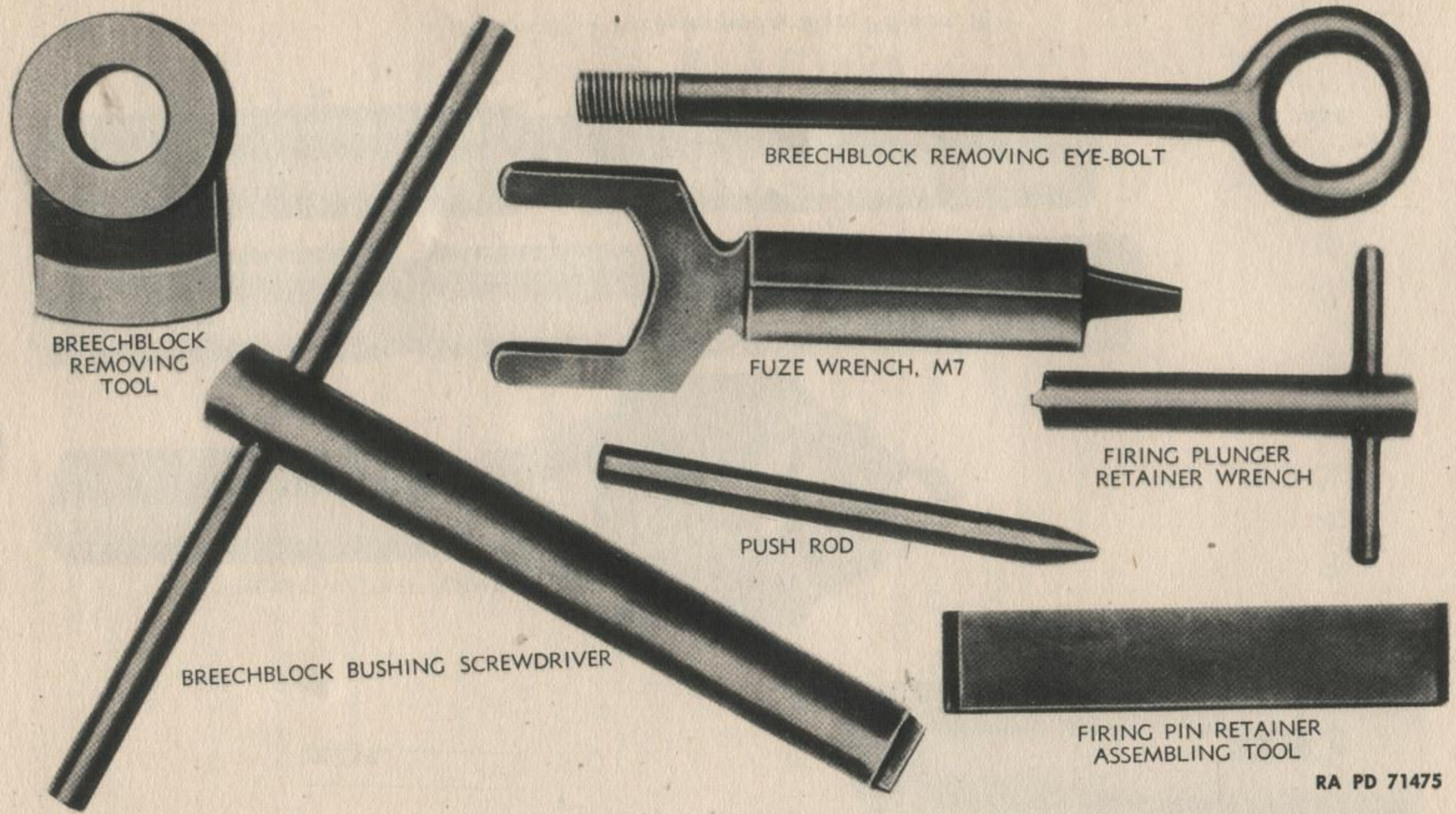

Figure 82 — Accessories

ARMAMENT SPARE PARTS AND ACCESSORIES

Item	Stowage Position
COVER, muzzle	On gun
EXTENSION, oil gun	Rear turret box
EYEBOLT, breechblock removing	Rear turret box
GUN, oil	Rear turret box
HAMMER, machs., ball peen, 20 oz	Rear turret box
RAMMER, cleaning and unloading, M3	Right sponson
ROD, push	Rear turret box
ROLL, spare parts	Rear turret box
STAFFS (for brush and rammer)	Left sponson
TOOL, breechblock removing	Rear turret box
WRENCH, fuze, M7	Rear turret box

(1) ARTILLERY GUN BOOK (fig. 52). The gun book (O.O. Form 5825) is used for the purpose of keeping an accurate record of the materiel. It must always remain with the materiel regardless of where it may be sent. The book is divided as follows: Record of assignments, company commander's daily gun record, inspector's record of examination, as well as forms to be filled out in case of premature explosions. This book should be in the possession of the organization at all times, and its completeness of records and its whereabouts are the responsibility of the company commander. It must also contain date of issuance of the materiel, by whom used, and the place where issued. If a new gun is installed on the mount, all data recorded in the old book with reference to sights, mounts, etc., must be copied into the new gun book before the old book is relinquished.

NOTE: Record of assignment data must be removed and destroyed prior to entering combat.

(2) BORE BRUSH M15. The bore brush is used in conjunction with the staffs for cleaning the bore of the gun.

(3) BREECHBLOCK REMOVING EYEBOLT. This eyebolt screws into the top of the breechblock and is used for lifting the breechblock out of breech ring.

(4) BREECHBLOCK REMOVING TOOL. This is a circular tool having a flange on one end. It is used for supporting the breechblock on the bottom of the U-slot of the breech ring when assembling and disassembling the breech mechanism.

(5) CLEANING AND UNLOADING RAMMER M3. This rammer is a bell-shaped head which can be assembled to the staffs by a threaded shank. It is used from the muzzle end of the gun for removing lightly stuck projectiles.

(6) EMPTY CARTRIDGE BAG. This is a canvas bag which fits on the mount and receives the spent cartridge cases as the shells are fired.

(7) FUZE WRENCH M7. This wrench has a screwdriver portion at one end which sets the fuze to either "superquick" or "delayed" action. The wrench portion is not used as the round fired is issued fuzed.

(8) PUSH ROD. This tool is a rod with a hardened end used for removing the spline shaft when disassembling the breech operating mechanism.

(9) STAFFS. Wooden staffs are issued with the materiel for use with the bore brush and rammer.

c. Accessories for Cal. .50 Machine Gun.

Item	Stowage Position
BAG, empty cartridge	On gun
BAG, metallic belt link	On gun
BOOK, Field Manual 23-65	Back of driver's seat
BOX, ammunition, M2	Right turret box
BRUSH, cleaning, cal. .50, M4	Rear turret box
CASE, cleaning rod, M15	Rear turret box
CHUTE, metallic belt link, M1	Rear turret box
COVER, gun and cradle. cal. .50	On gun
COVER, spare barrel, M13	On barrel
COVER, tripod mount	On tripod
ENVELOPE, spare parts, M1	Rear turret box
EXTRACTOR, ruptured cartridge	Rear turret box
OILER, filling, oil buffer	Rear turret box
ROD, cleaning, jointed, cal. .50, M7	Rear turret box
WRENCH, combination, M2	Rear turret box

ARMAMENT SPARE PARTS AND ACCESSORIES

(1) CLEANING BRUSH, CAL. .50, M4. This brush consists of a brass wire core, bronze bristles and brass tip. The tip is threaded for attaching to the jointed Cleaning Rod M7.

(2) JOINTED CLEANING ROD, CAL. .50, M7. This rod consists of five sections having an assembled length of about 48 inches. The first section has a slot for holding the cleaning patch and a threaded hole to receive the Cleaning Brush M4. The rear section swivels in a one-piece cast handle.

(3) OIL BUFFER FILLING OILER. This is a commercial type oiler of ½-pint capacity, finished in phosphate black. It is used for replenishing the oil buffer with OIL, recoil, light (USA specification 2-36D). No other type of oil should be kept in this oiler and it should not be used for lubricating purposes.

(4) SPARE BARREL COVER M13, 45-IN. This is a cloth cover provided for storing the extra barrel which is included in armament spare parts. It serves to protect the threads and to exclude dirt.

(5) COMBINATION WRENCH M2. This is a special combination tool for disassembling, assembling and making adjustments of the machine gun. Each opening and projection is marked to show its purposes.

(6) EMPTY CARTRIDGE BAG. This is a specially designed cloth bag to be attached to the gun for collecting the ejected empty cartridge cases during firing.

(7) METALLIC BELT LINK CHUTE M1 WITH BAG. This metal chute and cloth bag are assembled to the right side of the feed mechanism to collect the expended metallic belt links while the gun is being fired.

Section XII

SIGHTING EQUIPMENT

	Paragraph
General	83
Periscope M4 with telescope M47	84
Telescope T76 and telescope mount T59	85
Adjustments	86
Gunner's quadrant M1 or M1918	87
Care and preservation	88

83. GENERAL.

a. The sighting equipment used with the 76-mm Gun M1 and Gun Mount T1 is made up of the Periscope M4 and Telescope M47, and Telescope T76 and Telescope Mount T59 (figs. 83 and 84). The equipment is designed to aim the 76-mm gun for direct firing.

b. The Periscope M4 is used as an observing instrument and as a sighting element for laying the 76-mm gun in azimuth and elevation.

c. The Telescope T76 is a direct sighting element used to lay the 76-mm gun in azimuth and elevation.

d. Two Periscopes M6 are used for observation. These periscopes are similar to the Periscopes M4, except that they have no telescopes for sighting.

84. PERISCOPE M4 WITH TELESCOPE M47.

a. The Periscope M4 (figs. 85 and 86) is parallelepiped in shape and of the simple mirror type. Two parallel mirrors, facing each other, are mounted in the upper and lower parts of the periscope. A telescope is mounted on the right-hand side in a position where its field of view is visible through the lower mirror. The reticle pattern seen in the telescope is shown in figure 44. The periscope fits into a rectangular slot in the periscope holder and is located and held by a spring and secured by a knurled nut on the forward side. A handle is provided for withdrawing the periscope from the periscope holder.

b. The head assembly of the periscope houses three optical elements, the horizontal window, the vertical window and the mirror. A

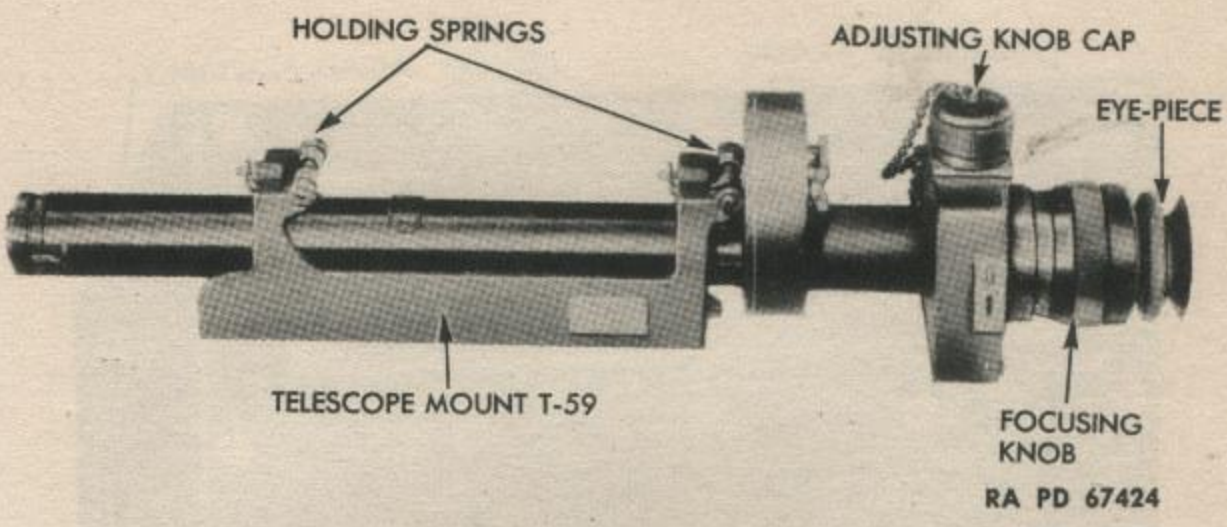

Figure 83 — Telescope T76 and Telescope Mount T59

latch arrangement holds the head firmly on the periscope body. The arrangement of these parts is such that the head can be removed readily. When the periscope is in place in the periscope holder (fig. 31) only the head projects through the turret. Plastic material is used in the construction of the head to permit it to shatter into small fragments when struck by a projectile. Several spare heads are furnished with each periscope. A notation label is attached to the rear side of each head. This label is for recording the serial number, the elevation and deflection knob settings of the periscope when bore sighting the periscope with the gun.

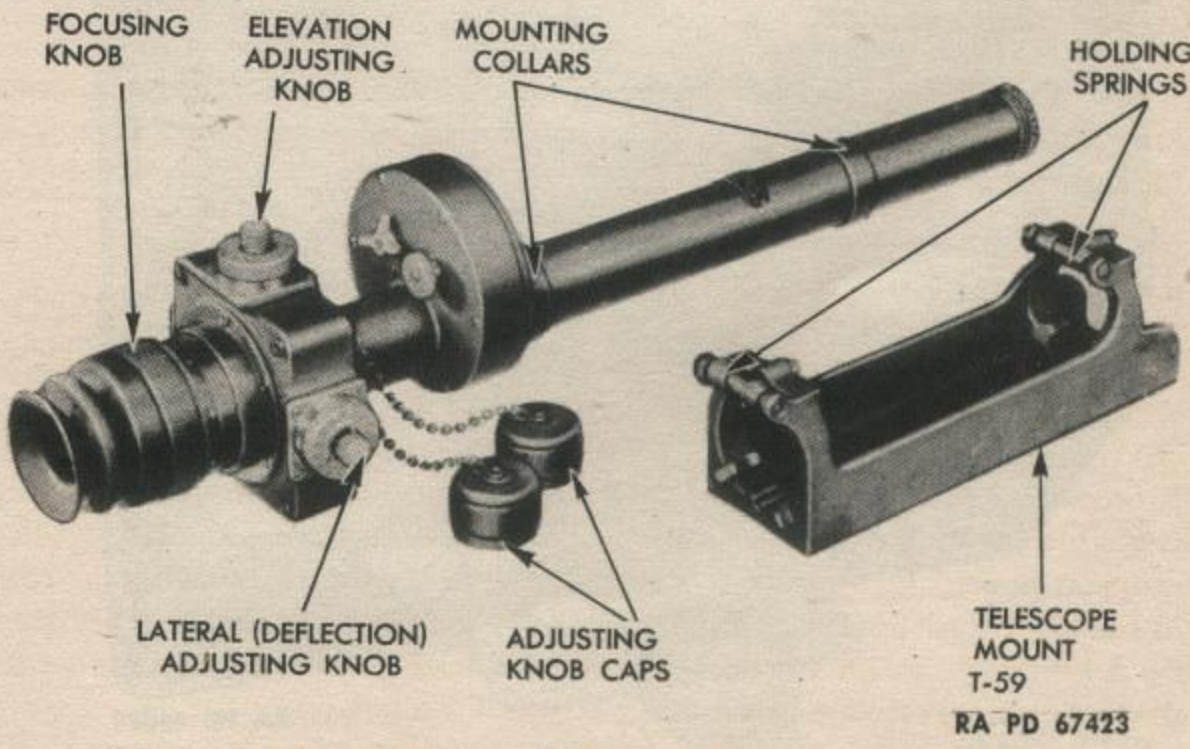

Figure 84 — Telescope T76 and Telescope Mount T59 (Shown Separately)

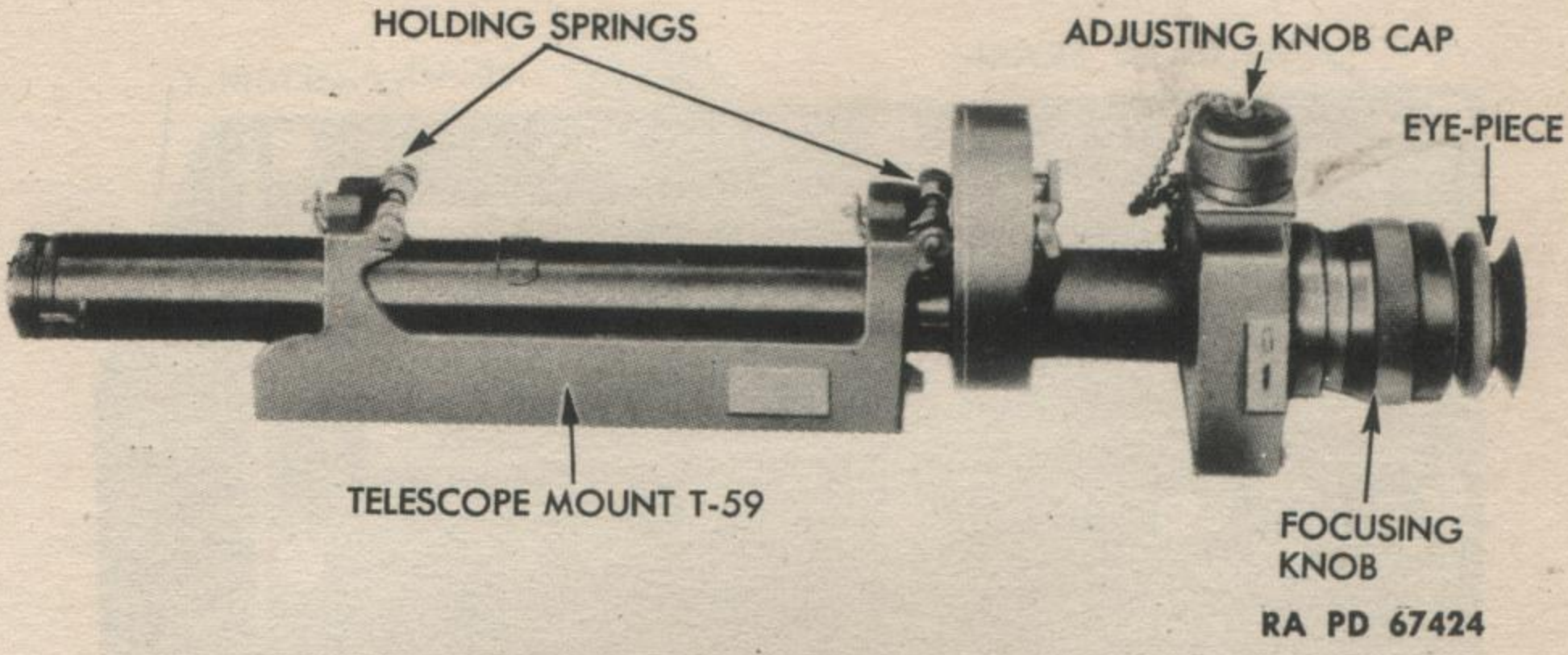

Figure 83 — Telescope T76 and Telescope Mount T59

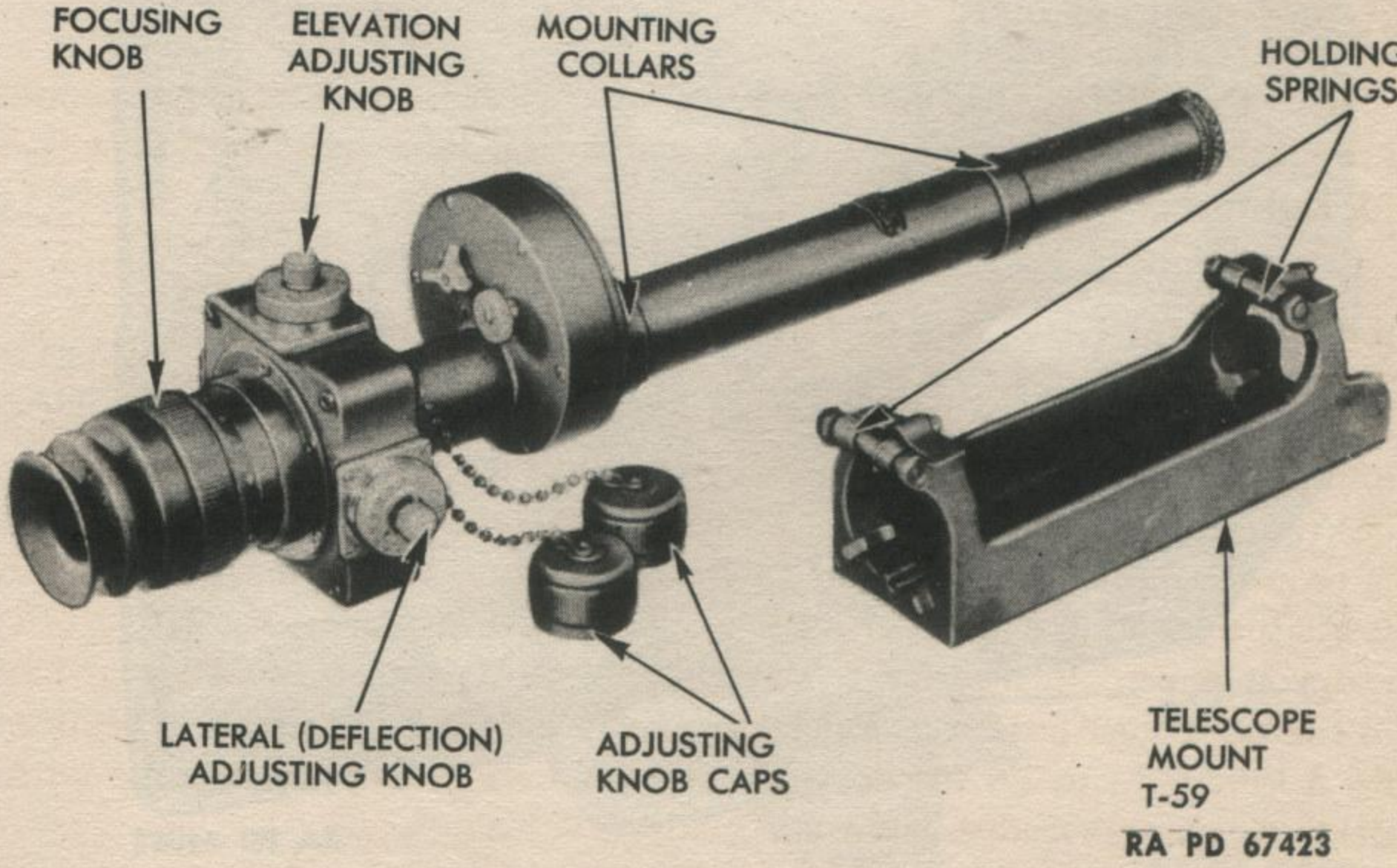

Figure 84 — Telescope T76 and Telescope Mount T59 (Shown Separately)

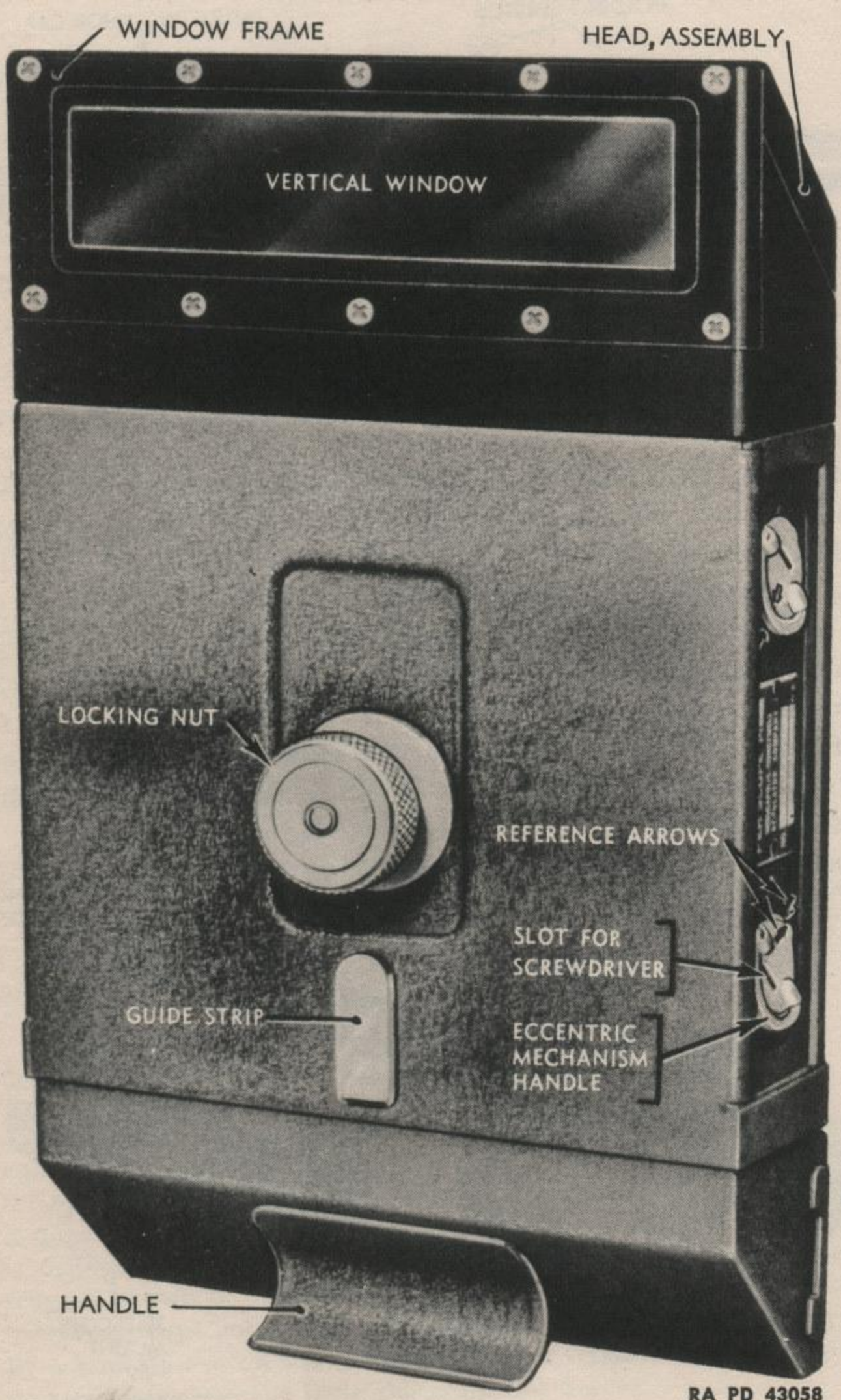

Figure 85 — Periscope M4

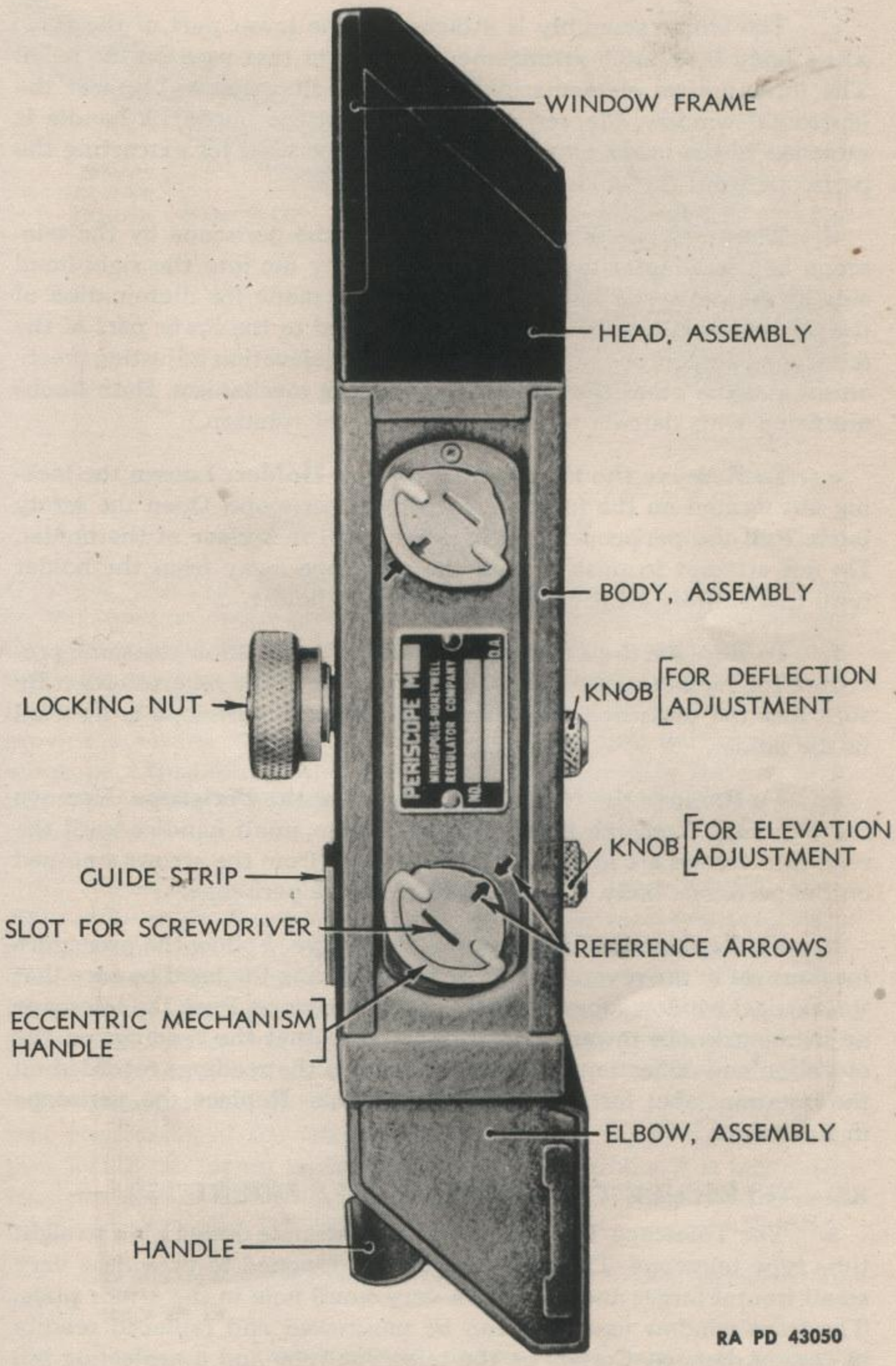

Figure 86 — Periscope M4 — Side View

c. The elbow assembly is attached to the lower part of the periscope body by a latch arrangement similar to that used on the head. The three optical elements inclosed in the elbow assembly are: the horizontal window, the vertical window and the mirror. A handle is attached to the lower part of the elbow to be used for extracting the periscope from the holder (fig. 31).

d. The telescope is held in position in the periscope by the telescope holder adapter assembly. This adapter fits into the right-hand side of the periscope body. No provision is made for illumination of the telescope reticle. Two knobs are attached to the lower part of the telescope adapter; one operates the telescope elevation adjusting mechanism and the other the deflection adjusting mechanism. Both knobs are fitted with detents to prevent accidental rotation.

e. **To Remove the Periscope from the Holder.** Loosen the locking nut located on the forward side of the periscope. Open the safety latch. Pull the periscope straight down until it is clear of the holder. Do not attempt to push or pull the periscope away from the holder until it is entirely clear of the bottom of the holder.

f. **To Replace the Periscope in the Holder.** Follow the same procedure for replacement as for removal except in the reverse order. Be sure that the periscope latch is closed after the periscope is inserted in the holder.

g. **To Remove the Head Assembly from the Periscope.** Remove the periscope from the holder. Turn the two small handles until the reference arrows are almost 90 degrees away from the arrows stamped on the periscope body. Lift the head from the periscope.

h. **To Replace the Head on the Periscope.** Follow the procedure for removal in the reverse order. When replacing the head be sure that the vertical window faces the front of the periscope. Push the telescope adjustment knobs inward and turn them so that the readings on the elevation and deflection scales correspond to the readings recorded on the notation label for that specific periscope. Replace the periscope in the holder.

85. TELESCOPE T76 AND TELESCOPE MOUNT T59.

a. The Telescope T76 (or T44 for an alternate design) is a straight tube type telescope. The objective end is designed to provide a very small frontal target and requires a very small hole in the armor plate. The front window assembly can be unscrewed and replaced readily in case of damage. Collars on the telescope tube and a projecting pin on the rear collar correctly position the telescope in its mount. Knobs

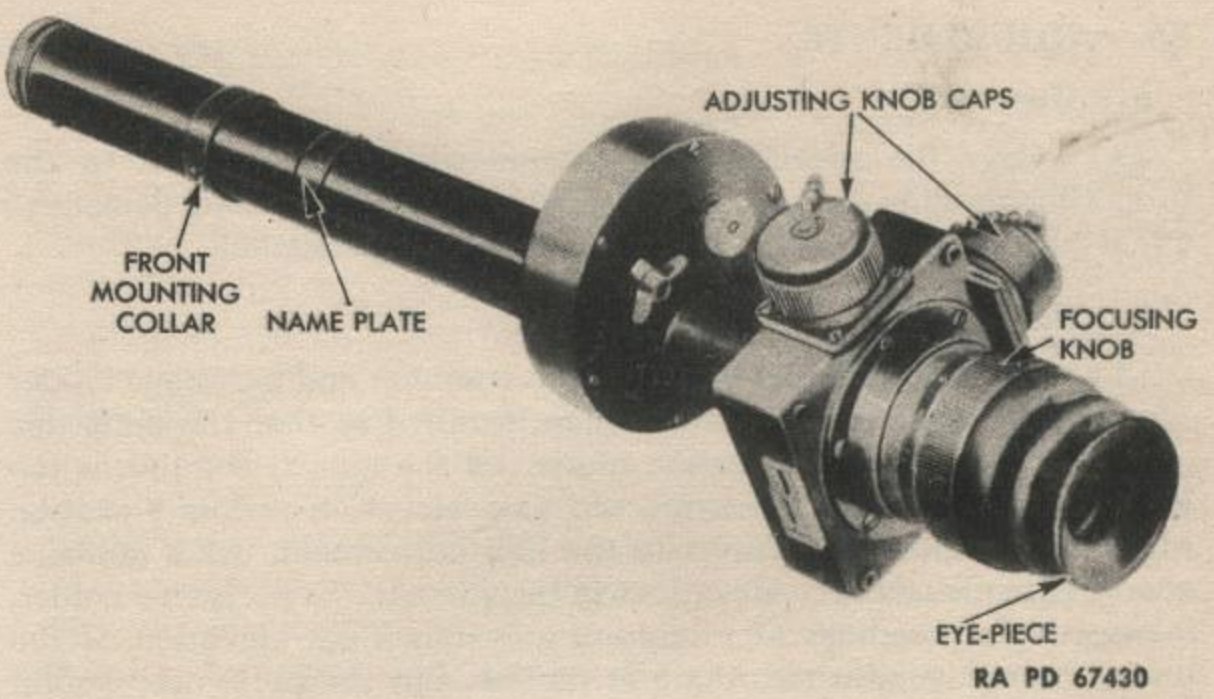

Figure 87 — Telescope T76

(covered with caps when not in use) adjust the telescopic field; one on the top side operates the adjusting mechanism for elevation and the other on the right side, the lateral adjusting mechanism (deflection). Scales beside the knobs provide means of recording the adjustments made. A focusing knob and diopter scale near the eyepiece provide a means of bringing the field of view into perfect focus. A telescope adjustable crash pad assembly is secured to the cradle by two cap screws. The position of the pad is changed by loosening a clamping screw and moving it along the support bar.

b. Telescope Mount T59 is attached to the upper left side of the gun cradle rotor. It consists of a channel plate with two projections at each end that form rings, inside which the tube of the telescope is positioned. Telescope holding springs (which exert a downward force on the telescope tube) are secured to the front and rear ring projections by pins and held in a compressed position by pins. A notch on the rear lower surface of the mount receives a locating pin on the lower surface of the rear telescope mounting collar and insures a correct positioning of the telescope in the mount. Two $\frac{5}{16}$-inch dowel pins locate the mount on the gun cradle rotor where it is secured by four cap screws. The telescope mount may be identified by the name plate, riveted to the left side.

c. To remove the telescope from the mount, pull it rearward and out of the mount.

d. To install it, push it into the mount, being careful to guide the locating pin into the notch in the bottom of mount.

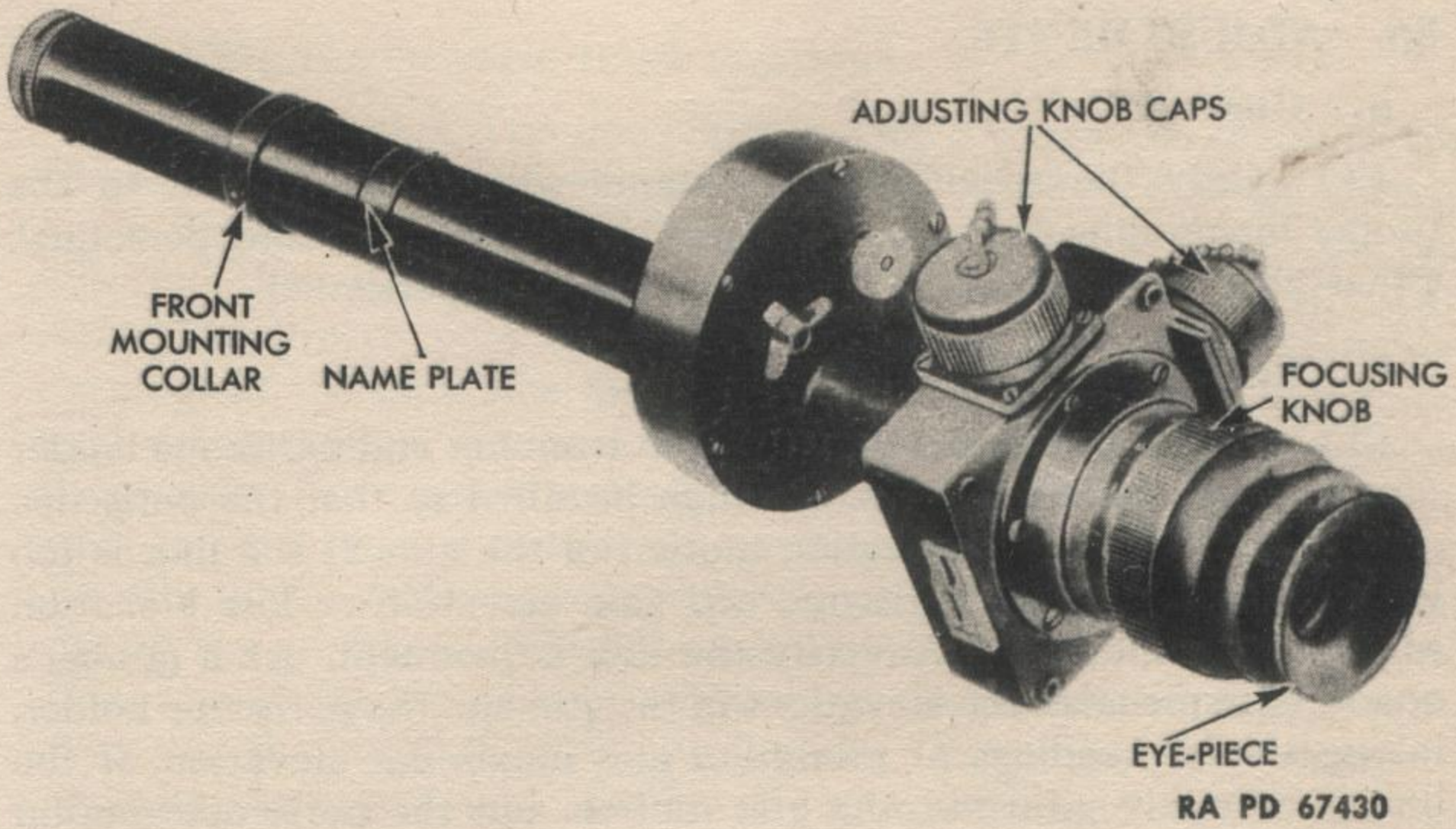

Figure 87 — Telescope T76

86. ADJUSTMENTS.

a. General.

(1) Only the specified adjustments which are incident to the proper functioning of the materiel will be made by the using personnel. Other adjustments will be made by ordnance personnel.

b. Periscope M4.

(1) The drag link between the gun trunnion and periscope holder (for Periscope M4) is adjusted when installed so that the periscope accurately follows the elevation motion of the gun. If the link is too long or two short, the periscope will gain elevation or lose elevation as the gun is elevated. To verify the link adjustment, use a gunner's quadrant to measure the elevations of the gun and the periscope holder, taking similar readings at minimum and maximum elevation. If the link is correctly adjusted, the gun motion and the periscope motion will be equal.

(2) The telescope of the periscope is adjusted when installed so that the line of sight through the center of the zero range line on the telescope reticle is parallel to the axis of the bore of the gun. The installation of a new head assembly on the periscope makes it necessary that the telescope be properly adjusted in the periscope. Do not remove the telescope or associated adjusting mechanism from the periscope body.

(3) When alining the bore of the gun with the Periscope M4, all heads in the vehicle, including spares, are to be checked. The telescope adjustments of the periscope, with the various heads, are to be recorded together with the periscope serial numbers in the spaces provided on the notation label of each periscope head.

c. Telescope T76.

The telescope is adjusted for azimuth and elevation by removing the screw caps from the adjusting knobs and turning the knobs. The knob on the right hand side adjusts the telescope for deflection and the knob on top adjusts it for elevation. During the operation of bore sighting, these adjustments should be made until the telescope is properly alined with the gun bore. The position of the adjusting knobs on the scales should be recorded for future reference.

d. Bore Sighting.

(1) GENERAL. The purpose of the bore sighting operation is to test the alinement of the sighting equipment for parallelism with the gun bore and to provide a basis for adjustment if the sighting equipment is found to be out of alinement.

(2) EQUIPMENT FOR BORE SIGHTING.

(a) Bore Sights. The line which passes through the center of the gun bore is chosen as the reference line from which all adjustments are made. The bore sights issued with the gun are used to determine this line. The bore sights consist of a breech bore sight and muzzle bore sight. The breech bore sight is a disk which fits accurately in the chamber of the gun. The model of the cannon for which it is to be used is engraved on the disk. A small peep hole is drilled in the center of the disk. The muzzle bore sight includes a quantity of black linen cord, to be stretched tightly across the muzzle, vertically and horizontally in the witness marks thereon, and a web belt to be buckled around the muzzle to hold the cords in place. If the issue bore sights are not available, the removal of the firing mechanism from the breechblock and the use of the firing pin hole as a peep sight may be substituted for the breech sight. In lieu of the muzzle sight, crossed strings may be attached across the muzzle by securing them with a rubber band, string, tape or web belt.

(b) Testing Target. Either a sharply defined distant aiming point or a testing target may be used in the adjustment procedure for alinement of the telescopes with the axis of the gun bore. If testing targets are not available they may be constructed as follows: Measure and record the horizontal and vertical distances from the center of the bore to the optical center of each telescope. Construct the testing target on cardboard or some other suitable material by setting two points apart, horizontally and vertically, by the same amount that the optical center of the telescope is offset from the axis of the bore. Mark these aiming points plainly for each telescope and for the bore. Be careful to place the aiming point for the telescope on the proper side of the aiming point for the bore. Indicate the top of the testing target so that it will not be reversed accidentally.

(c) Gunner's Quadrant. The gunner's quadrant is described in paragraph 87.

(3) PRELIMINARY SETTINGS.

(a) It is important that the line through the cradle trunnions, crosswise to the gun bore, be fairly level for bore sighting. The leveling can be checked with a gunner's quadrant. The trunnions will generally be level when the vehicle is on level ground.

(b) Alinement of telescopes can be performed either by use of a testing target or by use of a sharply defined distant aiming point. The use of the testing target establishes the telescope line of sight parallel to the gun bore. The use of a distant aiming point results in a line of sight which converges toward the line of the gun bore. The more distant the point, the more nearly parallel will be the line

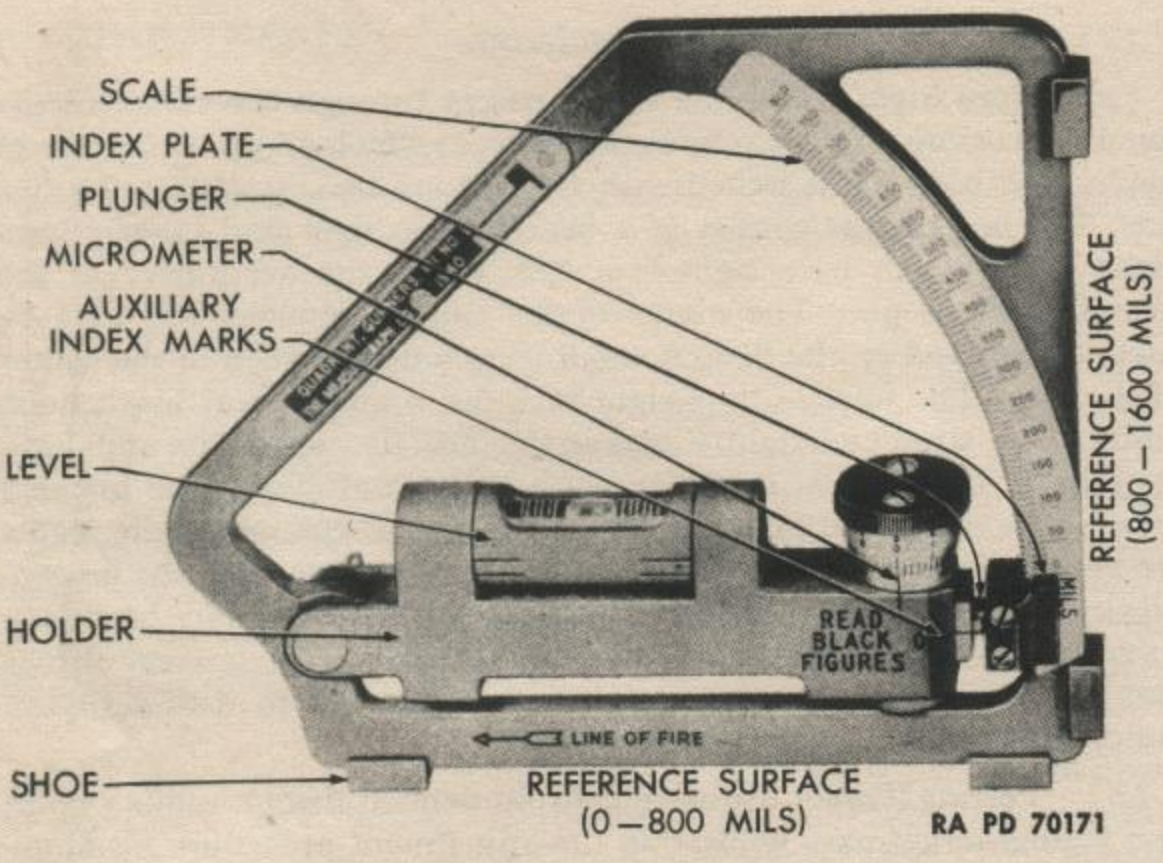

Figure 88 — Gunner's Quadrant M1

of sighting and the axis of the bore. If the aiming point is chosen about 1,000 yards or more distant, the line of sight and the axis of the bore will be near enough to parallel for all practical purposes. Choice of method will depend on time and facilities available. The aiming point may be used whenever the testing target is not available, but its use is necessarily restricted to open terrain and clear weather. The testing target can be used at night, and requires only an open space of 120 feet or less.

(c) When using the testing target, line it up with the gun in the following manner: Level the gun with the elevating handwheel and check the leveling with a gunner's quadrant placed on the leveling plates on the breechblock. Hang the testing target on a support about 80 to 120 feet in front of the gun. The more distant the target, the less will be the error produced by inaccuracies in measuring the aiming points. The face of the target should be square with the gun bore. The horizontal edge of the target should be level. (If the gun trunnions are slightly out of level, the horizontal edge of the target should be out of level by the same amount and in the same direction. This measurement is avoided by leveling the gun trunnions at the start.) Move the testing target while maintaining the previous alinement, until the *bore* aiming point is seen through the bore sights, centered in the gun bore. Once this alinement has been obtained, do not shift the gun or testing target until the bore sighting has been completed.

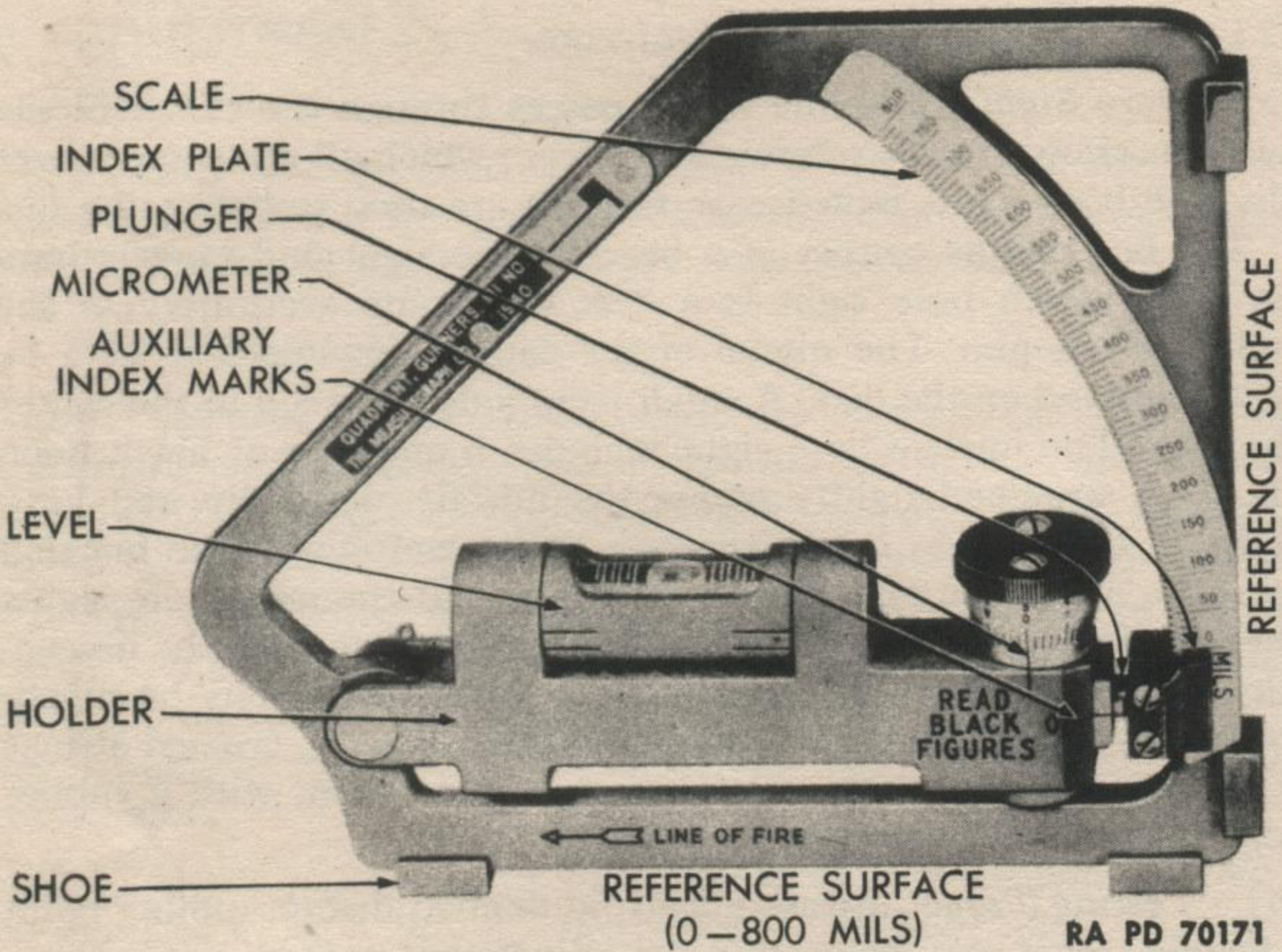

Figure 88 — Gunner's Quadrant M1

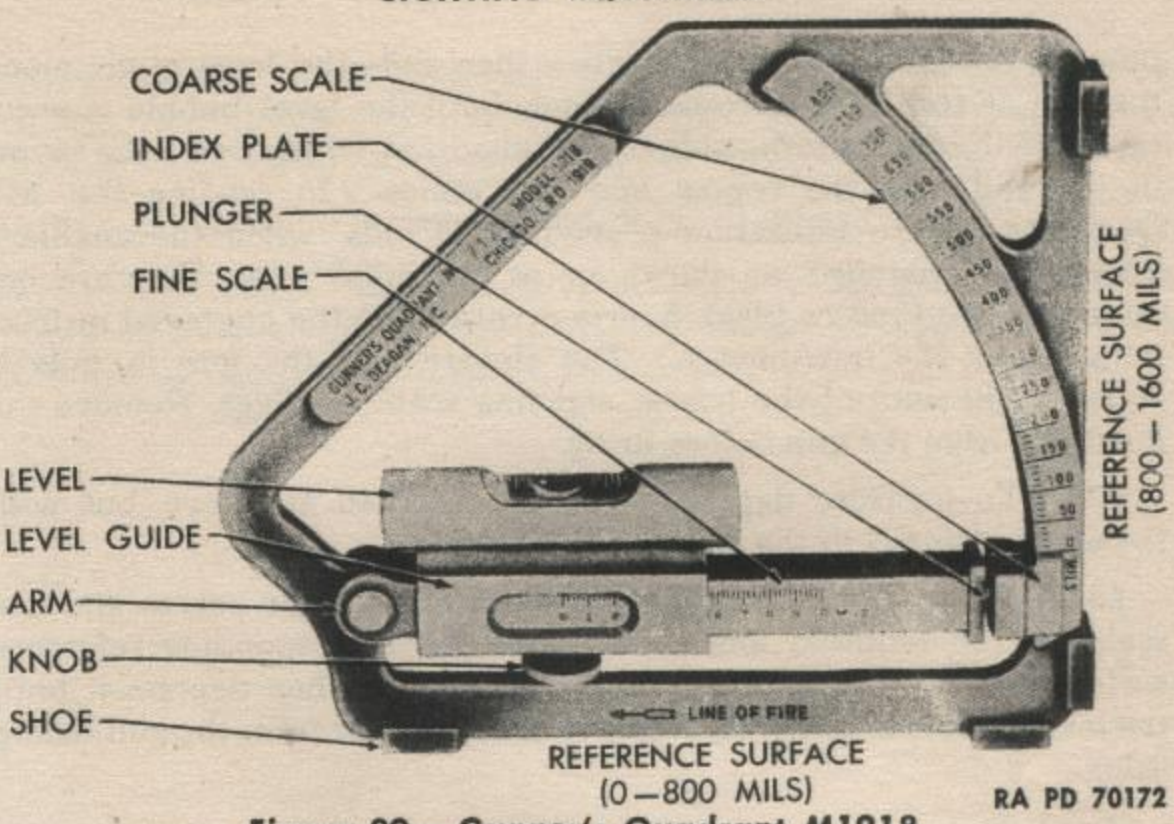

Figure 89 — Gunner's Quadrant M1918

87. GUNNER'S QUADRANT M1 OR M1918.

a. General. The gunner's quadrant is used for measuring the elevation or depression of the piece. The Gunner's Quadrant M1 (fig. 88) is the standard. The Gunner's Quadrant M1918 (fig. 89) is the substitute standard. Either quadrant may be furnished.

b. Description. The quadrant includes a sector-shaped frame to which is pivoted an arm carrying a level. The frame has two scales with corresponding reference surfaces. One scale and reference surface are used for elevations from 0 to 800 mils, and the other for elevations from 800 to 1,600 mils. Notches on the frame engaging with a plunger in the arm permit rapid setting of the arm in 10-mil steps. The level has a 10-mil smooth motion at each step to provide a fine indication to supplement the coarse scale reading. The method of obtaining the fine indication is the principal difference between the two quadrants. The M1918 has a slightly curved arm with the level guide arranged to slide along the arm; the M1 has a micrometer motion.

c. Operation.

(1) To measure the elevation of the gun, place the proper reference surface of the quadrant on the leveling plates, parallel to the bore, with the associated arrow pointing in the direction of fire. Set the level to indicate zero on the fine scale. Disengage the plunger from the notches in the frame, lift the arm and slowly lower it until the bubble is seen to pass through the central point. Allow the

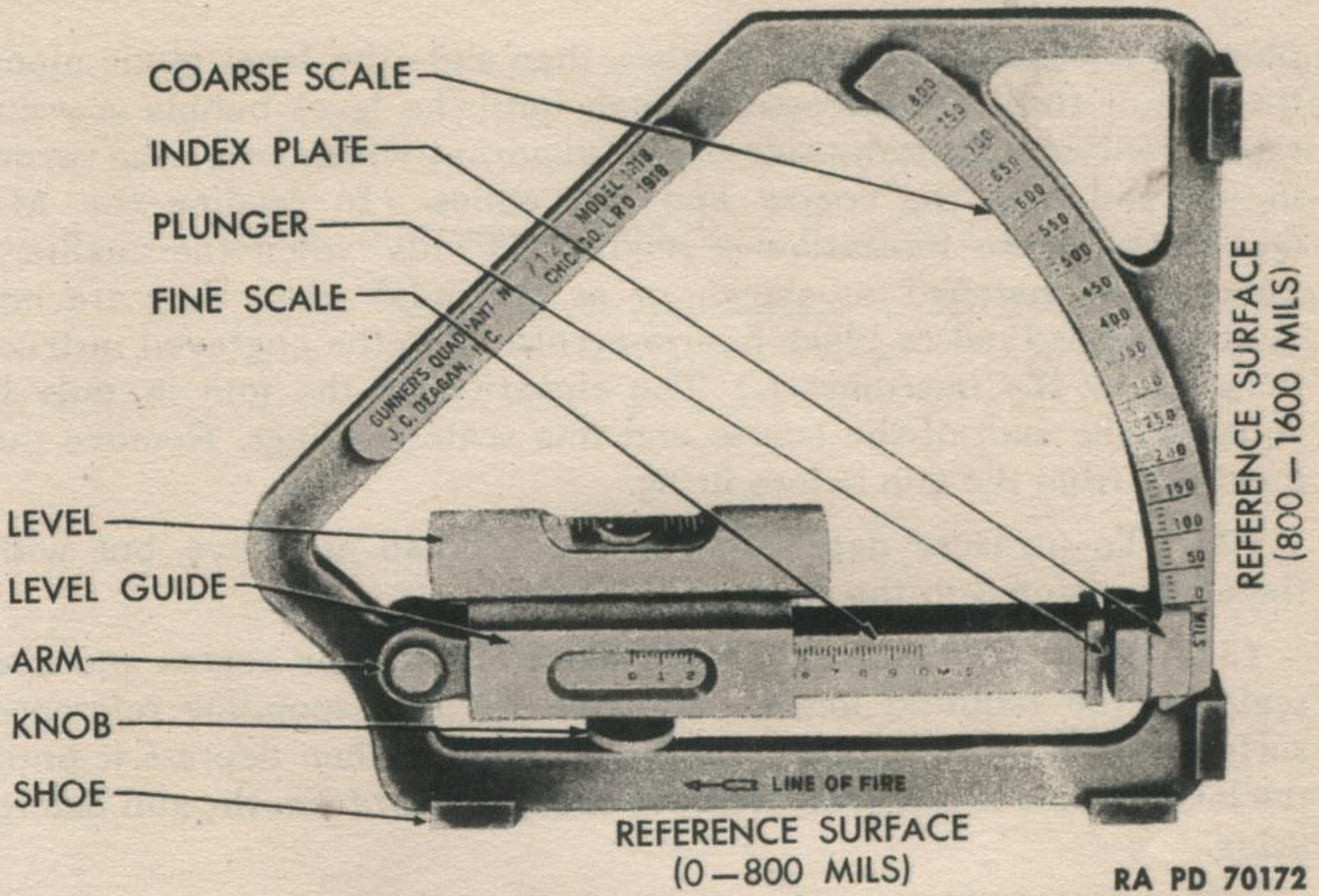

Figure 89 — Gunner's Quadrant M1918

plunger to engage with the notches, then slide the level guide along the arm or turn the micrometer knob until the level bubble is accurately centered. Face the side of the quadrant which bears the arrow in use and read the coarse and fine scales. (In reading the M1 Quadrant, a zero indication is read as "0 mils" when the auxiliary indexes are matched, as shown, or as "10 mils" when they are not matched. Read red or black figures according to the engraved instructions below the micrometer.) The elevation of the gun in mils is equal to the sum of the coarse and fine scale readings. Remove the quadrant from the gun before firing.

(2) To measure depression angles, proceed as above, but with the arrow pointed in the reverse direction.

(3) To lay the gun to a given elevation, set the coarse and fine scales to the required angle and place the corresponding reference surface on the leveling plates. Elevate the gun, then depress it until the level bubble is centered. Remove the quadrant from the gun before firing.

d. Test and Adjustment. No adjustment of the quadrant by the using arms is permitted. The zero indication may be verified by setting the quadrant to zero elevation, elevating or depressing the gun to center the bubble, then turning the quadrant end for end. If the bubble is not centered, determine the elevation or depression angle necessary to center it; one-half of this angle is the error and a corresponding correction should be applied to all subsequent indications in the 0-800 mil region.

e. Care and Preservation.

(1) Exercise particular care to prevent burring, denting or nicking of the reference surfaces and of the notched portion of the frame.

(2) Do not leave the quadrant on the gun while firing.

(3) When not in use, keep the quadrant in the case provided, with the shoes forming the reference surfaces lightly greased.

88. CARE AND PRESERVATION.

a. Remove the periscope and the telescope from the holder and the mount and stow them away when not in use.

b. Exercise care to prevent bumping or denting the periscope and telescope bodies.

c. Exposed glass surfaces of windows and lenses should be kept clean and dry. To remove dust from windows or lenses, brush the glass lightly with a camel's hair brush, knock dust out of brush and continue cleaning until all dust is removed. For wiping glass surfaces, use only PAPER, lens, tissue, especially intended for cleaning optical

glass. (Use of cleaning cloth is not permitted.) To remove oil or grease from optical surfaces, apply SOAP, liquid, lens cleaning, with a clean camel's hair brush and wipe dry with lens tissue.

d. Do not wipe lenses or windows with fingers.

e. If excessive dust or moisture collects on the inside of the windows or on the mirrors, the periscope should be disassembled and cleaned by competent ordnance personnel.

76-MM GUN MATERIEL M1 (COMBAT VEHICLES)

Section XIII

AMMUNITION

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89. GENERAL.

a. Ammunition for CARRIAGE, motor, 76-mm gun, T70, consists of:

(1) Rounds for GUN, 76-mm, M1.

(2) Cartridges for GUN, machine, cal. .50, M2, HB.

(3) Cartridges for the following basic weapons carried on the vehicle (personnel equipment):

(a) CARBINE, cal. .30, M1.

(b) RIFLE, U.S., cal. .30, M1903 (w/LAUNCHER, grenade, M1)†.

(4) Grenades.

(5) Smoke pots.

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†—Or LAUNCHER, rocket, AT, 2.36-inch, M1, together with 10 rockets (ROCKET, AT, 2.36-inch, M1). Information on the launcher and ammunition is published in TM 9-294. For authorized ammunition, see SNL S-9.

b. Ammunition for the GUN, 76-mm, M1, is issued in the form of fuzed complete rounds of fixed ammunition. The term "fixed" signifies that the ammunition is loaded into the cannon as a unit and that the propelling charge is not adjustable. Fixed ammunition is characterized by the rigid crimping of the cartridge case, containing the propelling charge and primer, to the fuzed projectile. A complete round includes all the ammunition components required to fire a weapon once.

c. Ammunition for the machine gun, carbine, and rifle comprises small-arms ammunition. A complete round of small-arms ammunition is known as a cartridge, and in general consists of a bullet, a propelling charge, a primer, and a cartridge case, all assembled in a unit.

d. Grenades are of two types, those thrown (hand grenades) and those for projection from a rifle or carbine by means of a launcher and a special blank cartridge (rifle grenades). Hand grenades are fitted with a fuze which explodes the grenade after a few seconds. Rifle grenades function on impact.

90. NOMENCLATURE.

a. Standard nomenclature is used in this section in all references to specific ammunition items. Its use for all purposes of record is mandatory.

91. FIRING TABLES.

a. For applicable firing tables, see section XIV.

92. CLASSIFICATION.

a. General. Ammunition is known as service, practice, blank or dummy (drill). Service rounds are used for effect, practice rounds for training in marksmanship. Blank ammunition, which contains no projectile, is provided for saluting purposes and for simulated fire. Drill ammunition is completely inert (contains no explosive) and is used for practice in handling, and loading the weapon.

b. Service ammunition for the GUN, 76-mm, M1, is classified, depending on the type of projectile, as high-explosive, armor-piercing, or chemical. High-explosive shell are relatively thin-walled and contain a comparatively large high-explosive bursting charge, for the most effective fragmentation and blast at the target. Armor-piercing types are either solid shot, or thick-walled shell containing a comparatively small amount of high explosive and a base fuze, for effect against armored vehicles and similar targets. Chemical shell contain a chemical filler which produces either a toxic or an irritant physiological effect, a screening smoke, an incendiary action, or any combination of these.

The chemical shell for this gun is a smoke producer of the base ignition type, that is, the chemical filler is ignited by the propelling charge when the shell is fired.

c. Small Arms Ammunition.

(1) The principal classification of service ammunition used in the small-arms weapons listed in paragraph 89 is:

(a) Armor-piercing, for use against armored or other bullet-resisting targets.

(b) Ball, for use against personnel and light materiel targets.

(c) Incendiary, for incendiary effect.

(d) Tracer, for observation of fire. Tracer bullets have an incendiary effect.

(2) Types for special purposes are; blank, dummy, and grenade, a special type for projecting grenades.

d. Grenades.

(1) Fragmentation, which breaks into small pieces upon bursting.

(2) Offensive, containing a high-explosive charge in a paper body, for demolition effect.

(3) Chemical, containing a chemical agent which produces a toxic or irritant physiological effect, smoke, an incendiary action, or any combination of these.

(4) Antitank, containing an explosive charge, for penetration of armored targets.

(5) Practice, for training or practice in aiming and firing.

(6) Training, containing no explosive or chemical (inert).

93. IDENTIFICATION.

a. General. Ammunition is completely identified, except as to grade, by marking and painting on original packing containers. Once removed from its packing, artillery ammunition and grenades are identified by painting and marking (including ammunition lot number) as described in **e** below. Other essential information may also be obtained from the marking. The muzzle velocity of projectiles may be obtained from the firing tables. Small-arms ammunition is identified, except as to grade as described in subparagraph **e** (3) below.

b. Mark or Model. To identify a particular design, a model designation is assigned at the time the model is classified as an adopted type. This model designation becomes an essential part of the stand-

ard nomenclature and is included in the marking of the item. The present system of model designation consists of the letter "M" followed by an arabic numeral. Modifications are indicated by adding the letter "A" and the appropriate arabic numeral. Thus, "M41A1" indicates the first modification of an item for which the original model designation was "M41." Prior to 1 July 1925, it was the practice to assign mark numbers, that is, the word "Mark," abbreviated "Mk.," followed by a roman numeral, for ammunition other than small-arms ammunition, and to assign the year in which the design was adopted, preceded by the letter "M", as the model designation for small-arms ammunition.

c. Ammunition Lot Number.

(1) GENERAL. When ammunition is manufactured, an ammunition lot number, which becomes an essential part of the marking, is assigned in accordance with pertinent specifications. This lot number is stamped or marked on every item of ammunition, unless the item is too small as in the case of small-arms ammunition, and this lot number, or the repacked lot number for small-arms ammunition (see below), also appears on all packing containers. It is required for all purposes of record, including grading, use, and reports on condition, functioning, and accidents, in which the ammunition is involved. To provide for the most uniform functioning, all of the components in any one lot are manufactured under as nearly identical conditions as practicable. For example, in the case of fixed ammunition, all of the rounds in any one lot are assembled so as to consist of: Projectiles of one lot number (one type and one weight zone); fuzes of one lot number; primers of one lot number; propellent powder of one lot number. Therefore, to obtain the greatest accuracy in any firing, successive rounds should be from the same ammunition lot whenever practicable.

(2) SMALL-ARMS AMMUNITION. Repacked lot numbers are assigned to cartridges packed in rifle clips, web belts, and metallic link belts. These repacked lot numbers are stenciled on the side and one end of each packing box. The ammunition lot numbers of the cartridges comprising a repacked lot are listed on a reference card placed inside the packing box. The repacked lot number consists of the words "REPACKED LOT"; the letter "B," "C," or "L," for belted clipped, or linked cartridges, respectively; and the serial number assigned by the repacker.

(3) For small-arms ammunition every effort should be made to maintain the ammunition lot number of the cartridges after they are removed from their original packing. Cartridges, the ammunition lot number of which has been lost are placed in grade 3, that is, unserviceable ammunition which will not be issued or fired. Hence, upon re-

moval from packing, cartridges should be tagged or marked so as to preserve the ammunition lot number.

d. Grading. All ammunition is assigned a grade in accordance with pertinent specifications, inspection and test. In addition, small-arms ammunition is graded primarily on the qualities which make the lot especially suitable for use in a particular class of small-arms weapons. For example, a lot of ammunition assigned grade AC is especially suited for use in aircraft weapons. Ordnance Field Service Bulletin No. 3-5 lists, numerically, each lot of small-arms ammunition with its correct grade as established by the Chief of Ordnance. The grade is also indicated by the ammunition code symbol stenciled on the box. Lots of appropriate grade only will be fired. Grade 3, or III for ammunition other than small-arms ammunition, indicates unserviceable ammunition which will not be issued or fired.

e. Painting and Marking.

(1) GENERAL. Two systems of painting and marking are used, one for small-arms ammunition, the other for all ammunition other than small-arms ammunition. These two systems are described below. For markings on original packing containers, see paragraph 93.

(2) AMMUNITION OTHER THAN SMALL-ARMS AMMUNITION.

(a) Painting. Ammunition is painted primarily to prevent rust; secondary purposes are to provide, by the color, a ready means of identification as to type, and for camouflage. The color scheme for the 76-mm projectiles is as follows:

High explosive (and armor-piercing with explosive)	Olive-drab; marking in yellow
Armor-piercing without explosive	Black; marking in white
Chemical	Gray; one yellow band indicates smoke. Marking on the ammunition is in the same color as the band.

(b) Marking.

1. For purposes of identification, the following is marked on each round of 76-mm ammunition:

On the projectile:

Caliber and type of cannon in which fired.

Kind of filler, for example, "TNT."

Model of projectile.

Weight zone marking (on high-explosive shell only).

Lot number of filled projectile. Ordinarily the projectile lot number is not required after the complete round is assembled, hence it is stenciled below the rotating band, in which position it is covered by the neck of the cartridge case.

On the cartridge case (the following appearing on the base of the cartridge case is stenciled in black, unless otherwise indicated):

Ammunition lot number and loader's initials.

Model of projectile.

Caliber and model of cartridge case (stamped in the metal).

Cartridge case lot number, initials or symbol of cartridge case manufacturer and year of manufacture (stamped in the metal).

On the fuze (stamped in the metal):

Type and model of fuze.
Loader's initials.
Month and year loaded.
Loader's lot number.
Action, when required. For example, "SQ," "DELAY."

2. Hand grenades are marked for identification as follows:

Chemical grenades:

Kind of filler, for example, "TH INCENDIARY."
Loader's initials or symbol.
Lot number of filled grenade.

Offensive grenades:

Complete nomenclature, of grenade, lot number, and year loaded (on label secured circumferencially around the grenade body).

Antitank (rifle) grenades:

"GRENADE, A.T." and model designation.
Lot number of grenade.
Manufacturer's initials.
Month and year of manufacture.

Hand grenade fuzes:

Model of fuze.
Manufacturer's initials.
Lot number of fuze.
Year of manufacture.

(c) Weight Zone Marking. Small variations in weight occur during the manufacture of shell containing explosive. When required, such projectiles are grouped in weight zones so that appropriate ballistic corrections provided in firing tables may be applied for the variations in weight. The weight zone of the projectile is indicated thereon by squares, in the same color as the marking, with a prick punch mark in the center of each one, two, three or more such squares being used, depending on the weight of the loaded projectile. For 76-mm high explosive shell, two squares indicate "standard" or

"normal" weight, that is, the weight for which no weight corrections are necessary. The armor-piercing and smoke shell do not have weight zone markings.

(3) SMALL-ARMS AMMUNITION.

(a) Small-arms cartridges do not require painting. In general, the only symbols stamped on the cartridge are the manufacturer's initials and year of loading, which appear on the base of the cartridge case. Until recently, color bands were used on all packing boxes but their use is now discontinued. Boxes containing ammunition packed in clips, web belts and metallic link belts are identified by stenciled symbols and marking as described in paragraph 103.

(b) When removed from their original packing containers, cartridges may be identified, except as to ammunition lot number and grade, by appearance as illustrated in figures 96 and 97.

Type	Distinguishing Characteristics
Ball	Gilding metal jacket for bullet, no marking.
Armor-piercing	Tip of bullet painted black.
Incendiary	Tip of bullet painted blue.
Tracer	Tip of bullet painted red.
Dummy	Cartridge case is tinned, and no primer is present. In addition, the cartridge cases of cal. .50 dummy cartridges have three holes drilled in them.
Blank	No bullet.

(c) Care should be taken not to confuse the original markings, indicated in substep *(b)* above, with any subsequent markings made with lithographic marking ink. In connection with target practice, the tips of bullets from a particular machine gun or group of machine guns are sometimes coated with a distinctive color of lithographic ink. Upon striking the target, a smear of ink is left indicating the source of fire. For the method of application, see TM 9-855. Lithographic ink must be removed from all cartridges which are to be returned to storage.

94. CARE, HANDLING, AND PRESERVATION.

a. General. Ammunition is packed to withstand conditions ordinarily encountered in the field. Moisture-resistant containers and suitable packing boxes or crates are used when necessary to provide the required protection for shipment and storage. Care must be taken to keep packing boxes and crates from becoming broken or damaged. All broken boxes must be repaired immediately and all markings transferred accurately to the new parts of the box. When the

packing box contains a metal liner, the liner should be air-tested and sealed, provided that equipment for this work is available. When handling ammunition, due consideration should be given to the following:

(1) Do not break the moisture-resistant seal until ammunition is to be used. Ammunition removed from the airtight container, particularly in damp climates, is apt to corrode, thereby causing the ammunition to become unservicable.

(2) Protect the ammunition, particularly fuzes, from high temperatures, including the direct rays of the sun. More uniform firing is obtained if the rounds, especially the propelling charges, are at the same temperature.

(3) Ammunition and ammunition components should be protected from mud, sand, dirt, and water. If they get wet or dirty, they should be wiped off at once. Verdigris or light corrosion should be wiped off.

(4) Explosive ammunition, or components containing explosives, must be handled with appropriate care at all times. The explosive elements in primers and fuzes are particularly sensitive to undue shock and high temperature.

b. Ammunition Other Than Small-arms Ammunition. In addition to subparagraph a above, the following will be observed:

(1) Do not attempt to disassemble any fuze.

(2) Do not remove protection or safety devices from fuzes until just before use.

(3) Do not handle duds. Because their fuzes are armed and hence extremely dangerous, duds will not be moved or turned, but will be destroyed in place in accordance with TM 9-1900.

(4) Unfuzed grenades will not be fuzed in ammunition dumps or storage magazines, nor within 100 yards of adjacent buildings, nor in greater quantities than needed for immediate use.

c. Small-arms Ammunition. Small-arms ammunition, as compared with other types of ammunition, is not dangerous to handle. In addition to subparagraph a above, the following will be observed:

(1) The use of oil or grease on cartridges is prohibited. Greasing or oiling cartridges used in machine guns causes the collection of dust and other abrasives which are injurious to the gun. When oiled or greased cartridges are fired from small-arms weapons, dangerously high chamber pressures may result.

d. Storage Precautions.

(1) GENERAL. Whenever it is necessary to leave ammunition in

the open, raise it on dunnage at least six inches from the ground and cover it with a double thickness of tarpaulin. Suitable trenches should be dug to prevent water from flowing under the pile.

(a) Detonating fuzes and grenades containing phosphorus will be stored and transported separately from other explosive ammunition. However, nothing in this section shall be interpreted as prohibiting the carrying of all types of authorized rounds in this motor carriage.

(2) SMALL-ARMS AMMUNITION. In addition to the above, the following applies to small-arms ammunition:

(a) Whenever practicable, small-arms ammunition should be stored under cover. This applies particularly to tracer ammunition, which is subject to rapid deterioration if it gets damp, and may even ignite spontaneously.

(b) If practicable, tracer ammunition should be stored separately from other ammunition.

(c) In a fire, small-arms ammunition does not explode violently. There are small individual explosions of each cartridge, the case flying in one direction and the bullet in another. It is unlikely that the bullets and cases will fly over 200 yards. With ordinary care on the part of fire-fighting forces, a fire can be quickly controlled without danger.

95. PRECAUTIONS IN FIRING.

a. General. In addition to the precautions in paragraph 94, the following precautions will be observed:

b. Grenades.

(1) Do not attempt to disassemble any grenade.

(2) Do not pull out safety pin until grenade is ready to be thrown or fired.

(3) Never place an antitank (rifle) grenade on the launcher unless it is intended to be fired immediately.

(4) Since fragments may be projected over 200 yards, fragmentation grenades will not be used in training without adequate cover.

(5) Occasionally chemical grenades will flash upon functioning. Hence, when used in maneuvers, they will be thrown so as to function not less than 30 feet from personnel.

(6) Personnel not firing antitank grenades should not approach within 50 yards of the target nor within an angle of 30 degrees on either side of the line of flight of the grenade.

(7) Grenades should be located some distance left or right and never directly behind the firing points. Protective measures against

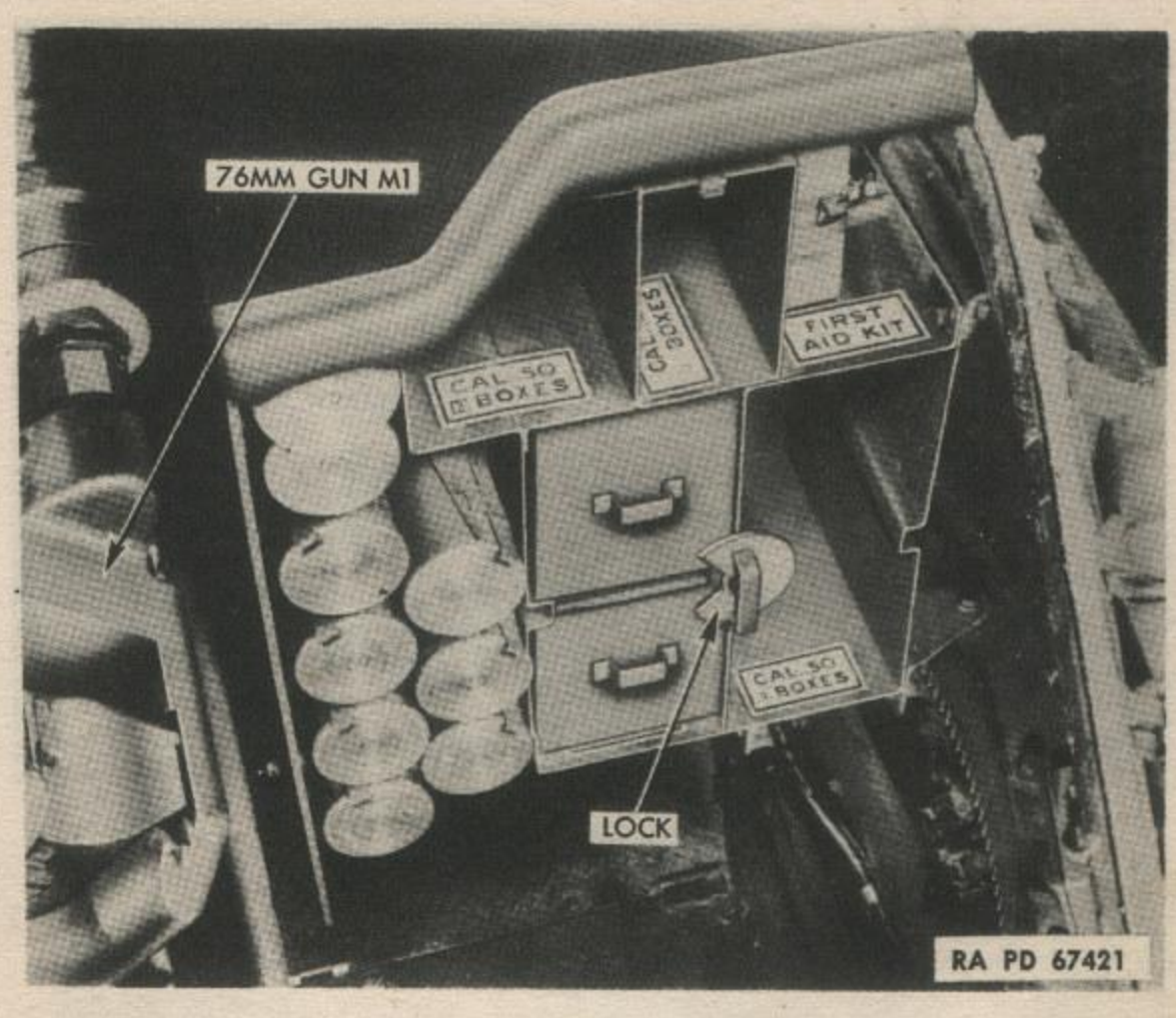

Figure 90 — Ammunition Stowage — 76-mm Gun Motor Carriage T70 (Right Half of Turret)

grass fires should be provided and extreme care should be taken to prevent a grenade from dropping into boxes of ammunition.

(8) Duds will not be handled but will be destroyed in place in accordance with FM 23-30.

(9) Only the authorized special types of blank cartridge listed in paragraph 96 will be used in projecting antitank grenades. Ordinary blank ammunition or ball ammunition will not be used.

(10) While the launcher is attached, the weapon may be used to fire service ammunition. Care must be taken to insure that the launcher is firmly attached to the weapon, otherwise the launcher may be damaged and inaccurate fire result.

(11) Launchers must be free of sand, dirt or grit. Grenades with bent or dented launcher tube should not be fired.

(12) If the weapon has been used to fire service cartridges, care must be taken to see that none are present in the chamber when the grenade is to be fired, as serious damage will result.

(13) If the special blank grenade cartridges misfire and no addi-

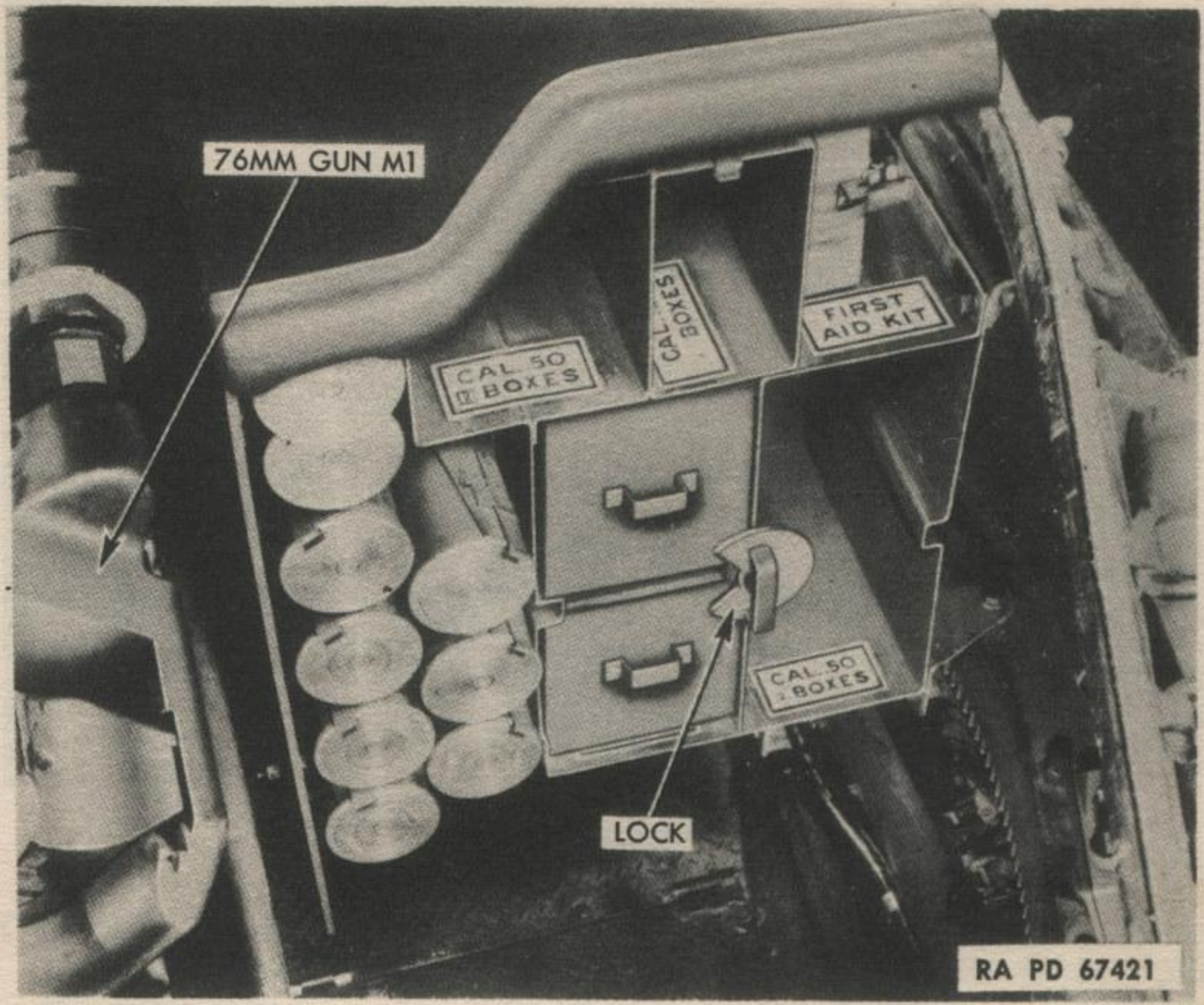

Figure 90 — Ammunition Stowage — 76-mm Gun Motor Carriage T70 (Right Half of Turret)

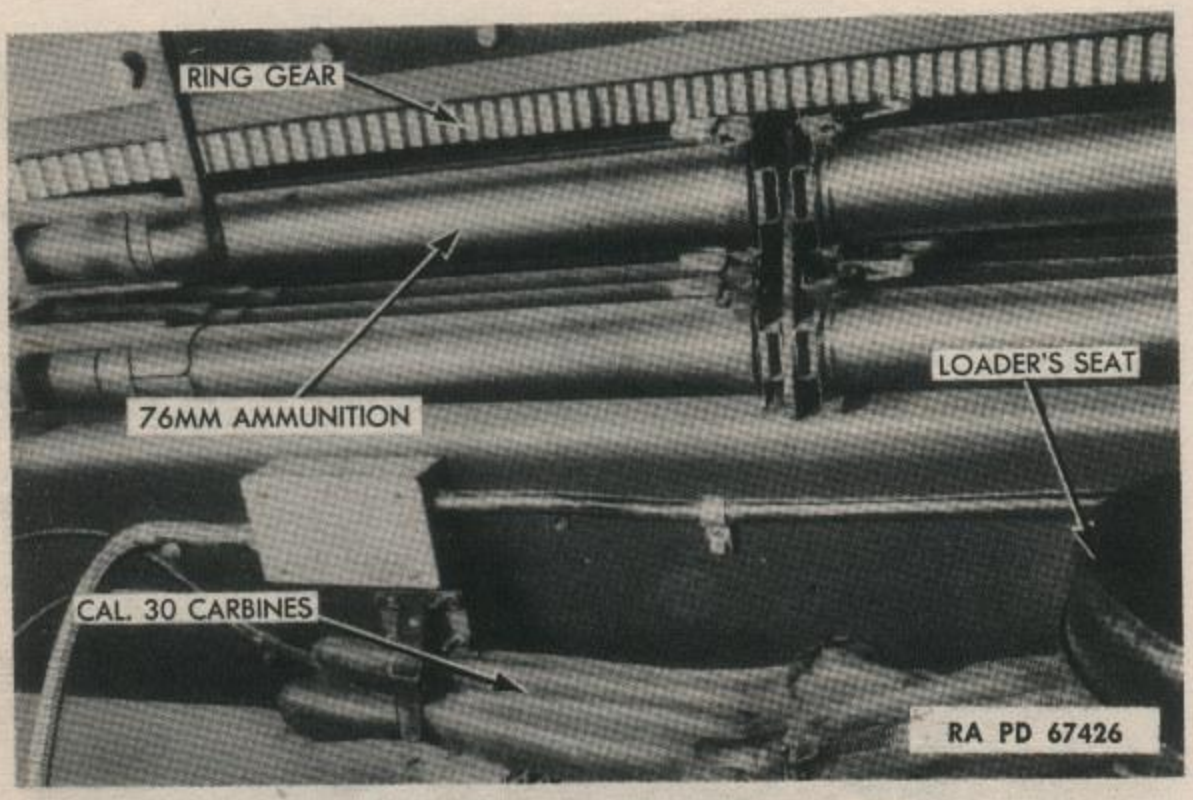

Figure 91 — Sponson Ammunition Racks

tional grenade cartridge is available, open the bolt, replace the safety pin, and remove the grenade.

96. AUTHORIZED AMMUNITION.

a. Ammunition authorized for use with the weapons mounted or carried on this motor carriage, and other ammunition carried thereon, are listed in Table I below. It will be noted that the nomenclature (standard nomenclature) completely identifies the ammunition as to type and model. The numbers in parenthesis preceding the nomenclature refer to assembly numbers in table III in paragraph 99.

TABLE I — AUTHORIZED AMMUNITION

FOR GUN, 76-MM, M1

Service Ammunition

(1) PROJECTILE, fixed, A.P.C., M62 w/FUZE, B.D., M66 or M66A1, and TRACER, 76-mm gun, M1

(2) PROJECTILE, fixed, A.P.C., M62, w/TRACER, 76-mm gun, M1

(3) SHOT, fixed, A.P., M79, w/TRACER, 76-mm gun, M1

(4) SHELL, fixed, H.E., M42A1, w/FUZE, P.D., M48, 76-mm gun, M1

(5) SHELL, fixed, H.E., M42A1, w/FUZE, P.D., M48A1, 76-mm gun, M1

(6) SHELL, fixed, smoke, HC, B.I., M88, 76-mm gun, M1

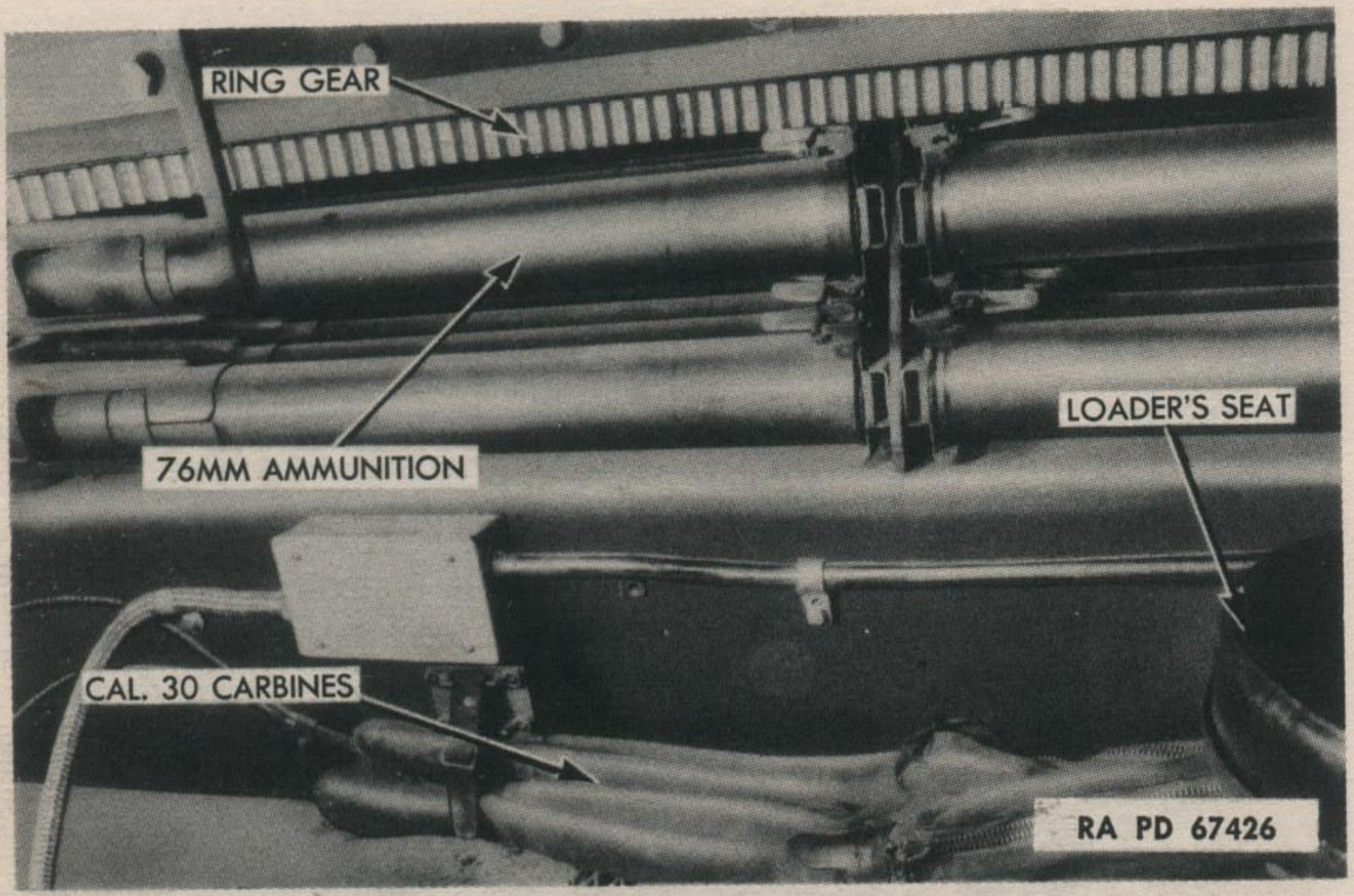

Figure 91 — Sponson Ammunition Racks

AMMUNITION

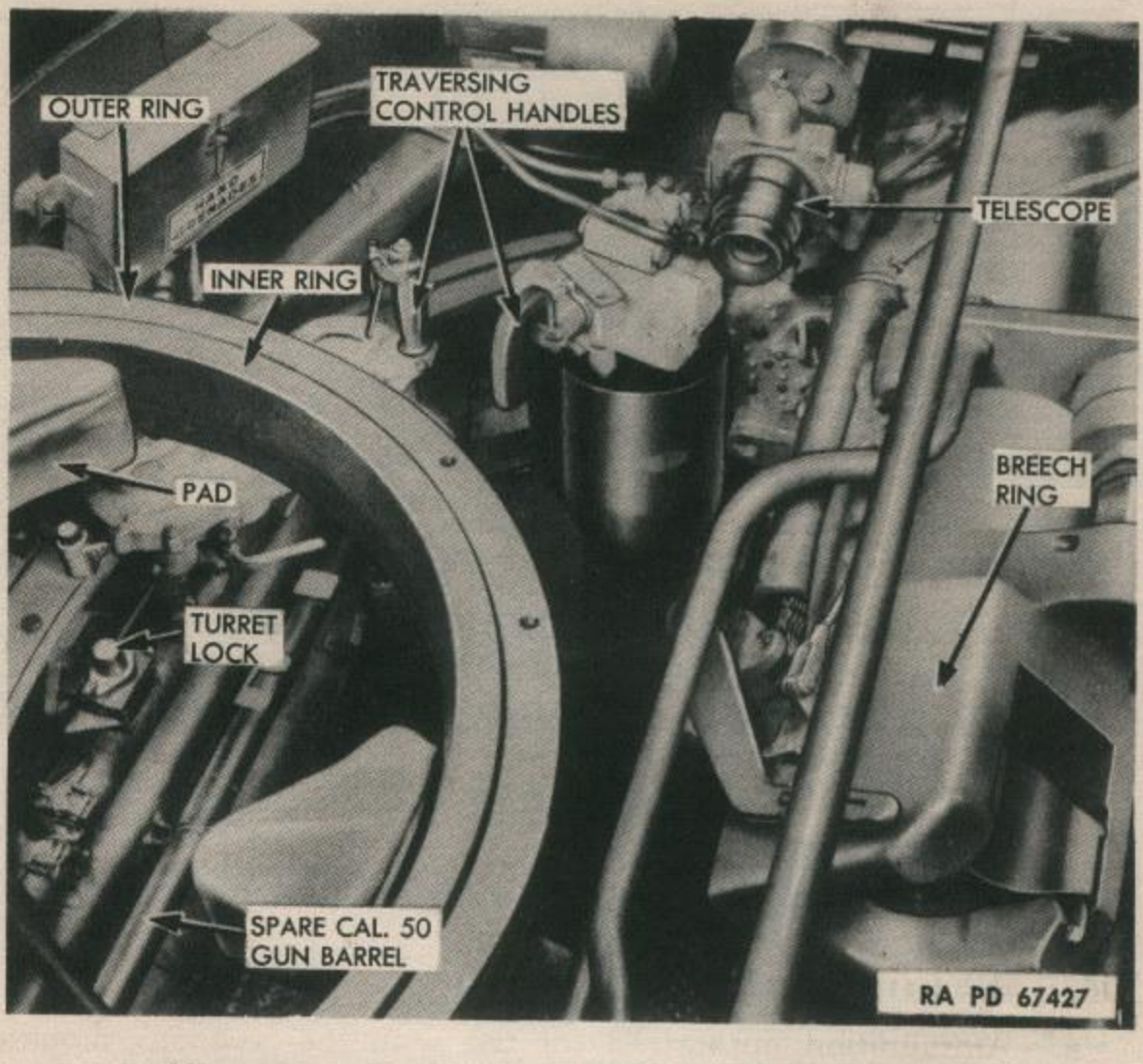

Figure 92 — Stowage Compartment — Left Sponson

FOR CAL. .50 MACHINE GUN

Service Ammunition

CARTRIDGE, armor-piercing, cal. .50, M2
CARTRIDGE, ball, cal. .50, M2
CARTRIDGE, incendiary, cal. .50, M1
CARTRIDGE, tracer, cal. .50, M1

Blank Ammunition

CARTRIDGE, blank, cal. .50, M1

Dummy Ammunition

CARTRIDGE, dummy, cal. .50, M1
CARTRIDGE, dummy, cal. .50, M2

FOR CAL. .30 RIFLE

Service Ammunition

CARTRIDGE, armor-piercing, cal. .30, M2

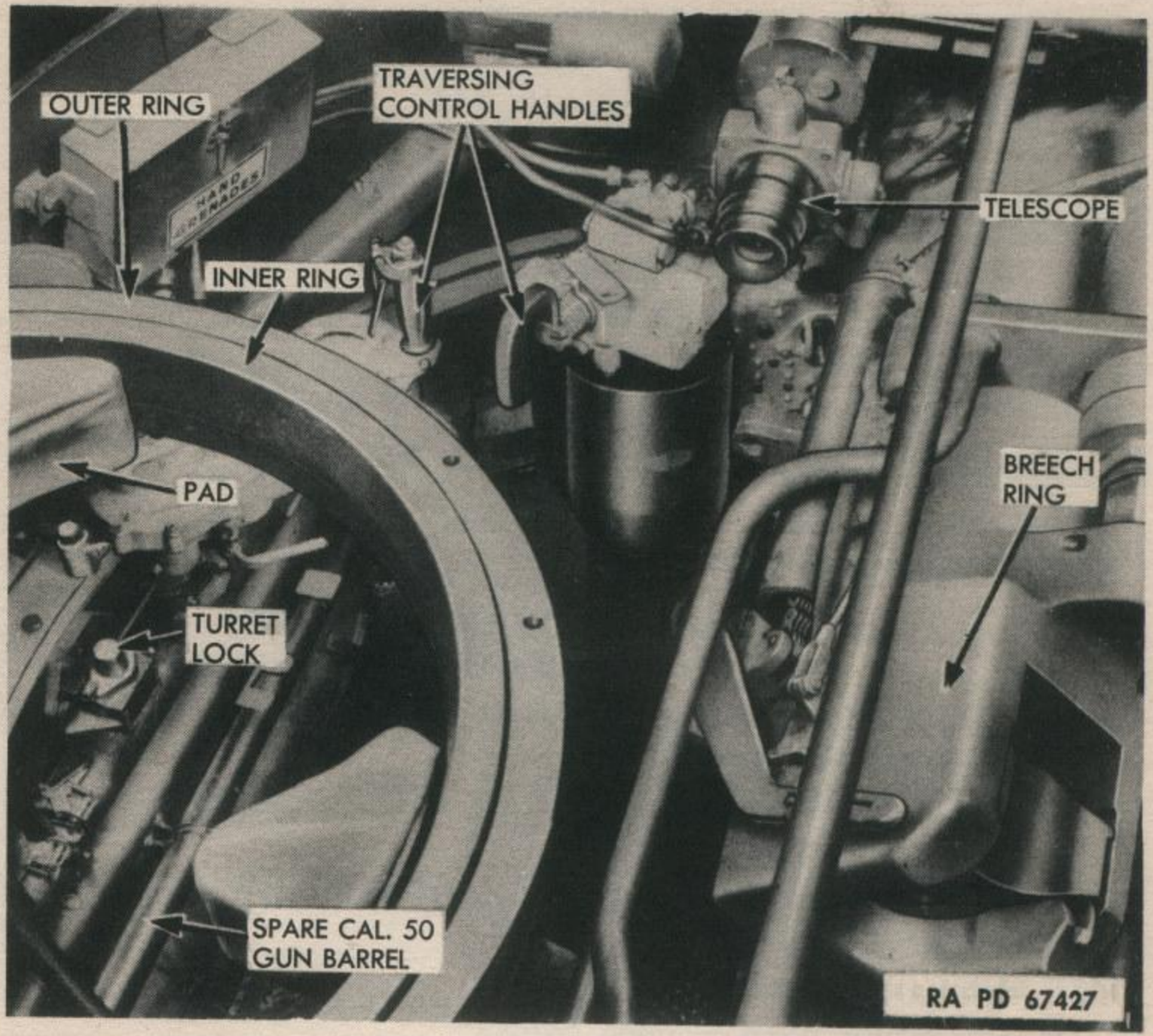

Figure 92 — Stowage Compartment — Left Sponson

76-MM GUN MATERIEL M1 (COMBAT VEHICLES)

Blank Ammunition

CARTRIDGE, blank, cal. .30, M1909
CARTRIDGE, rifle grenade, cal. .30, M3*

Dummy Ammunition

CARTRIDGE, dummy, cal. .30, M1906 (corrugated)

FOR CAL. .30 CARBINE

Service Ammunition

CARTRIDGE, carbine, cal. .30, M1

Blank Ammunition

CARTRIDGE, grenade, carbine, cal. .30, M6*

Dummy Ammunition

CARTRIDGE, carbine, dummy, cal. .30, M1

GRENADES AND GRENADE FUZES

Hand Grenades and Fuzes

GRENADE, hand, offensive, Mk. IIIA1, unfuzed (adapted for hand grenade detonating fuze, M6A2)
GRENADE, hand, offensive, Mk. IIIA2, unfuzed (adapted for hand grenade detonating fuze, M6A3)
GRENADE, hand, smoke, phosphorus, WP, M15 w/FUZE, detonating, hand grenade, M6A2**
FUZE, detonating, hand grenade, M6A2
FUZE, detonating, hand grenade, M6A3
GRENADE, hand, training Mk. IA1

Rifle Grenades

GRENADE, rifle, H.E., M9
GRENADE, A.T., M9A1
GRENADE, rifle, fragmentation, impact, T2
GRENADE, A.T., practice, M11
GRENADE, A.T., practice, M11A1
GRENADE, A.T., practice, M11A2
FIN, assembly, for practice rifle grenade, M11
FIN, assembly, for A.T., practice grenade, M11A1
FIN, assembly, for A.T., practice grenade, M11A2

SMOKE POTS

SMOKE POT, M1

*—Special blank cartridges for projecting rifle grenades from rifle or carbine.
**—Chemical Warfare Service procurement.

AMMUNITION

97. STOWAGE OF AMMUNITION.

a. Ammunition is stowed on the carriage as indicated in Table II below and in figures 90 to 92.

TABLE II – AMMUNITION STOWAGE

Ammunition	Stowage Provided (Number of Rounds)	Stowage Position
76-mm {90% A.P. 10% H.E.	48 rds.	In turret (ready rounds) and in sponson racks
Cal. .50 {80% A.P. 20% Tracer	1,000 rds.	In turret bins alongside of 76-mm ammunition
Cal. .30, carbine	400 rds.	*
Cal. .30, rifle, A.P.	60 rds.	In belt of man with rifle
Hand grenades	9 grenades	In box on turret wall
Rifle grenades†	10 grenades†	*
Smoke pots	4 smoke pots	*

98. PREPARATION FOR FIRING.

a. Ammunition for the 76-mm gun is ready for firing once removed from packing, except for setting the fuzes of the high-explosive shell for the required action. The procedure is described in paragraph 100.

b. Small-arms ammunition in appropriate clips and belts is ready for firing upon removal of outer packings.

c. Grenades have safety devices which must be removed before throwing or firing, as described in paragraph 101.

d. Procedure for igniting smoke pots is described in paragraph 102.

99. AMMUNITION DATA.

a. Information on the ammunition for GUN, 76-mm, M1, is given in Table III. The assembly number is for cross-reference to Table I, paragraph 96. Also see figures 93 and 94, inclusive.

b. Ballistic data on small-arms ammunition is given in Table IV.

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†—Or 10 rockets (ROCKET, A.T., 2.36-inch, M1).

*—Data not available at time of printing.

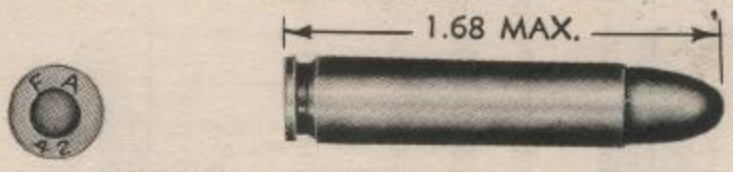
TABLE III

AMMUNITION DATA — 76-MM GUN M1

Assembly No.	Figure No.	PROJECTILE						COMPLETE ROUND			FUZE		PROPELLING CHARGE		PRIMER†	
		Kind	Type	Model	Approx. Weight (lb.)	CHARGE Type	CHARGE Weight (lb.)	Type	Approx. Weight (lb.)	Length (in.)	Type and Model	Action	Type of Powder	Weight (lb.)	Model	Type
1	94	PROJECTILE	A.P.C.	M62	15.44	Exp. "D"	0.14	Fixed	24.80	33.80	B.D., M66 or M66A1*	Delay	FNH	3.75	M28A2	300-gr.
2	—	PROJECTILE	A.P.C.	M62	14.91	None	None	Fixed	24.27	33.80	None**	——	FNH	3.75	M28A2	300-gr.
3	94	SHOT	A.P.	M79	15.00	None	None	Fixed	24.36	29.83	None**	——	FNH	‡	M28A2	300-gr.
4	95	SHELL	H.E.	M42A1	12.87	TNT	0.86	Fixed	22.49	34.30	P.D., M48	S.Q. & Delay (0.05-sec.)	FNH	3.75	M28A2	300-gr.
5	—	SHELL	H.E.	M42A1	12.87	TNT	0.86	Fixed	22.49	34.30	P.D., M48A1	S.Q. & Delay (0.15-sec.)	FNH	3.75	M28A2	300-gr.
6	95	SHELL	Chemical (smoke)	M88	7.60	HC	1.38	Fixed	13.43	28.56	None***	——	FNH	0.219	M28A2	300-gr.

A.P.—Armor-piercing
A.P.C.—Armor-piercing capped
B.D.—Base-detonating
FNH—Flashless nonhygroscopic
gr.—grain
H.E.—High explosive
P.D.—Point-detonating
S.Q.—Superquick

†—Alternative primer. PRIMER, percussion, M28B1A1.
*—Fuze contains tracer.
**—Tracer in projectile base.
***—No fuze; filler ignited by propelling charge when fired.
‡—Data not available at time of printing.



CARTRIDGE, CARBINE, CAL. .30, M1

CARTRIDGE, CARBINE, DUMMY, CAL. .30, M1

RA PD 49605

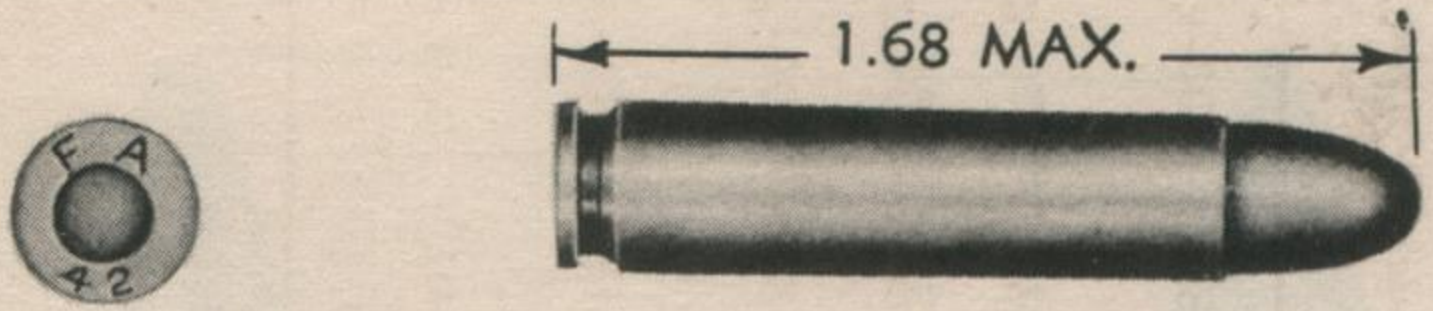
Figure 93 — Cartridges, Carbine, Cal. .30

TABLE IV — SMALL-ARMS AMMUNITION

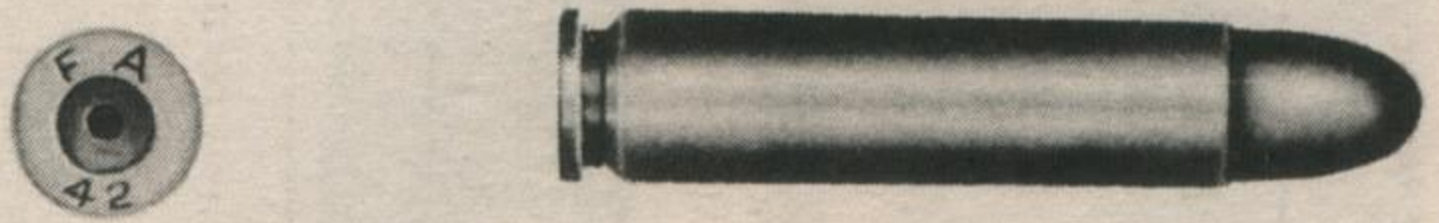
Nomenclature	BALLISTICS	
	Muzzle Velocity in Feet per Second	Maximum Range in Yards
CARTRIDGE, armor-piercing, cal. .50, M2	2,935	7,200
CARTRIDGE, ball, cal. .50, M2	2,935	7,200
CARTRIDGE, incendiary, cal. .50, M1	.....	.....
CARTRIDGE, tracer, cal. .50, M1 (length of trace, 1,600 yards)	2,865 (in 45-in. barrel)	3,500
CARTRIDGE, armor-piercing, cal. .30, M2	2,775	4,500
CARTRIDGE, ball, cal. .30, M2	2,805	3,500
CARTRIDGE, carbine, cal. .30, M1	2,000	2,000

100. ARTILLERY FUZES.

a. General. A fuze is a mechanical device used with a projectile to explode it at the time and under the circumstances desired. The fuzes described herein are all assembled to the rounds as issued; not issued separately for use in the field.



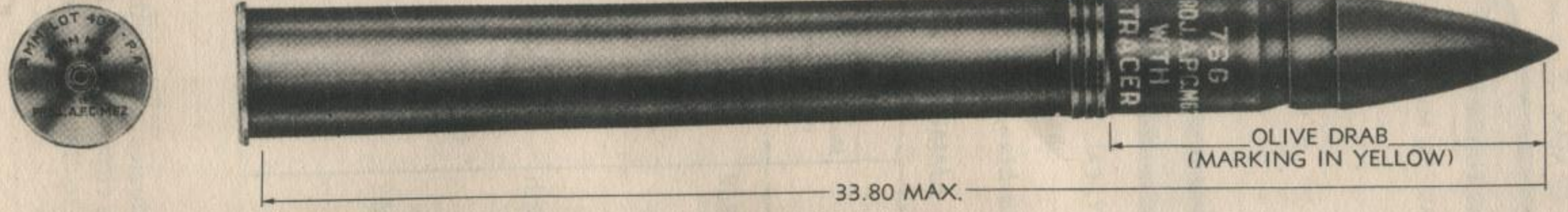
CARTRIDGE, CARBINE, CAL. .30, M1



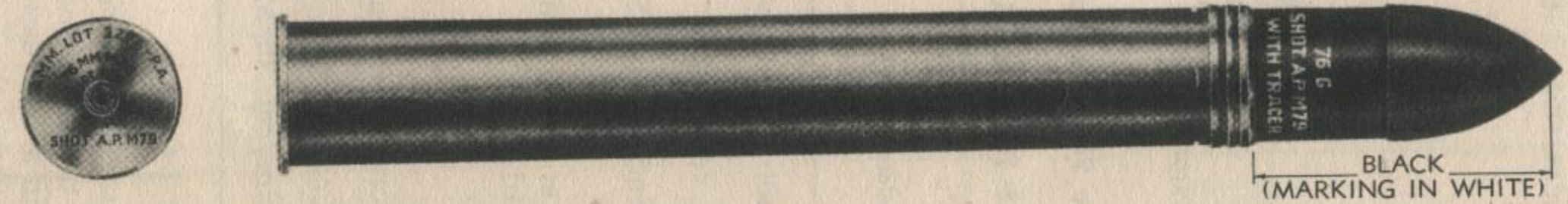
CARTRIDGE, CARBINE, DUMMY, CAL. .30, M1

RA PD 49605

Figure 93 — Cartridges, Carbine, Cal. .30



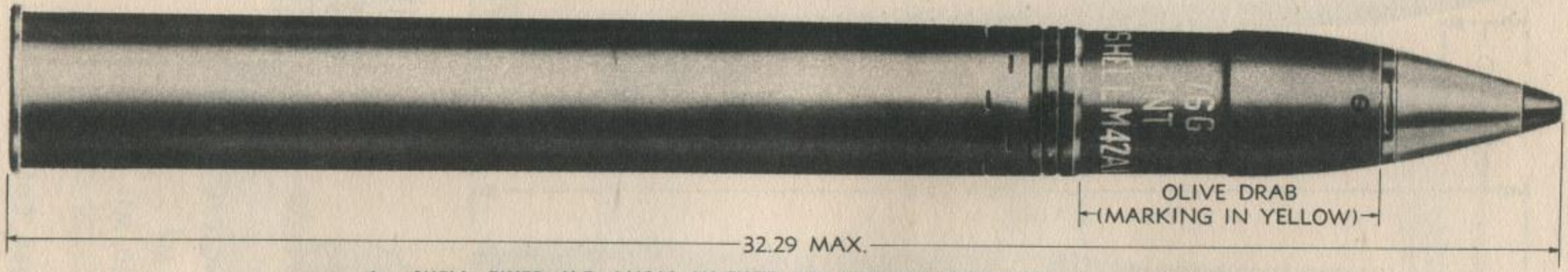
A – PROJECTILE, FIXED, A.P.C., M62, W/FUZE, B.D., M66 OR M66A1, AND TRACER, 76 MM GUN, M1



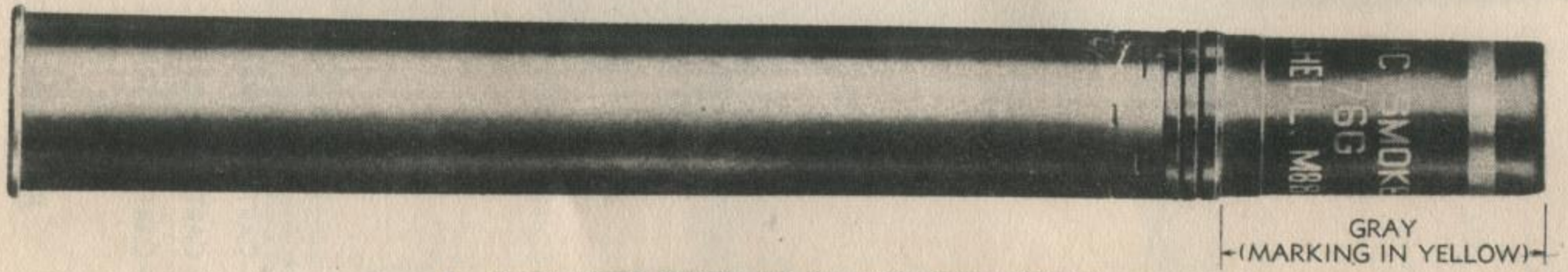
B – SHOT, FIXED A.P., M79, W/TRACER, 76 MM GUN, M1

RA PD 68312

Figure 94 — Ammunition for 76-mm Gun



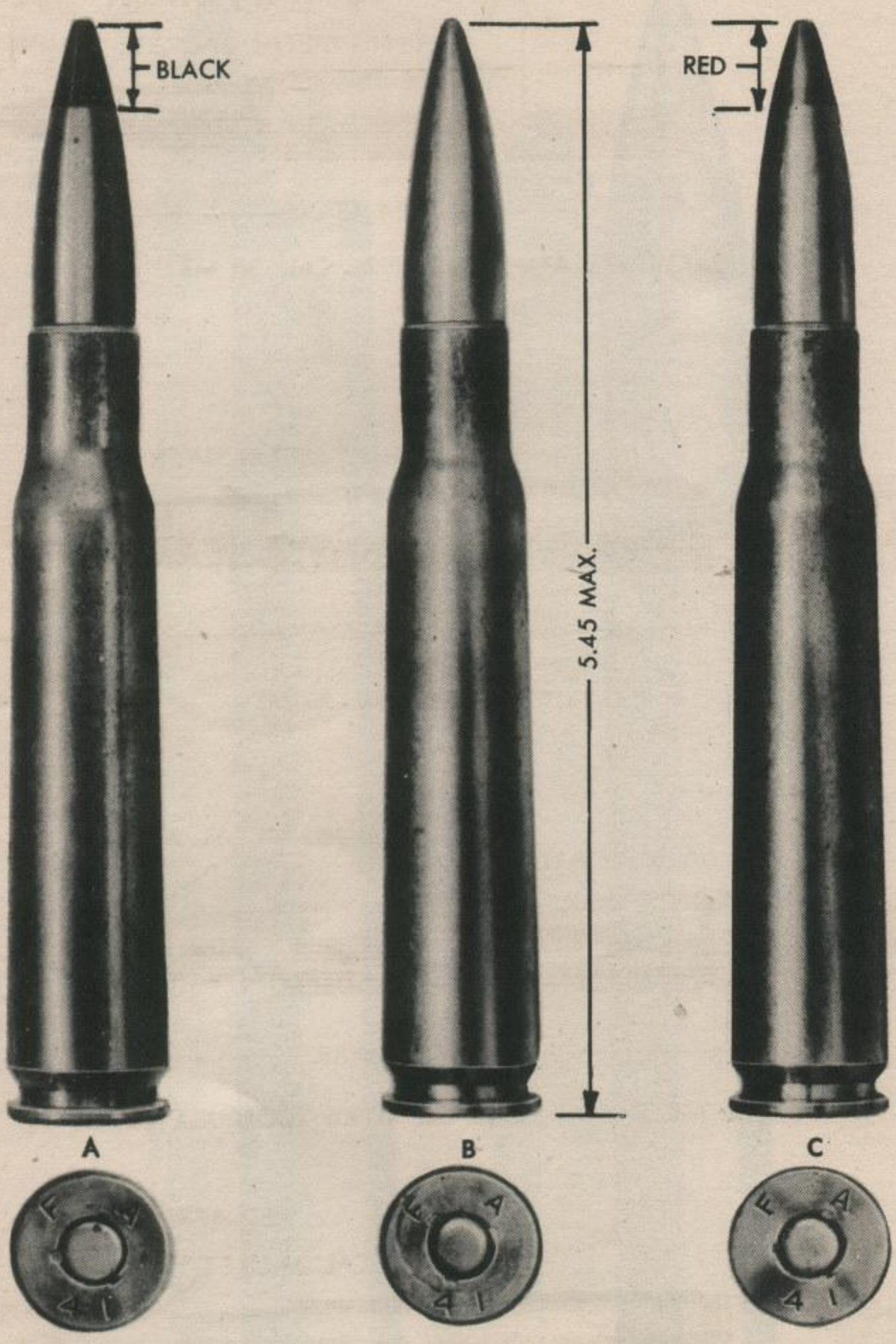
A — SHELL, FIXED, H.E., M42A1, W/FUZE, P.D., M48, 76-MM GUN, M1



B — SHELL, FIXED, SMOKE, HC, B.I., M88, 76-MM GUN, M1

RA PD 68313

Figure 95 — Ammunition for 76-mm Gun



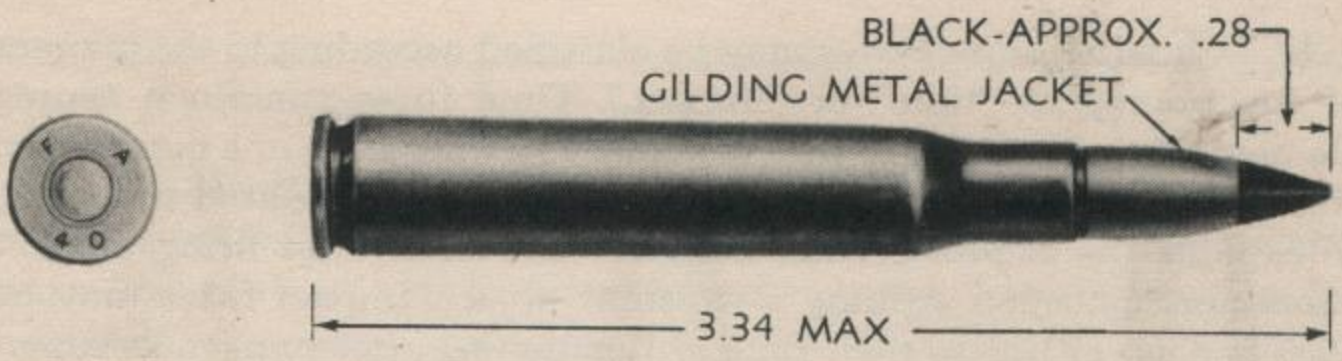
A—CARTRIDGE, ARMOR-PIERCING, CAL. .50, M2

B—CARTRIDGE, BALL, CAL. .50, M2

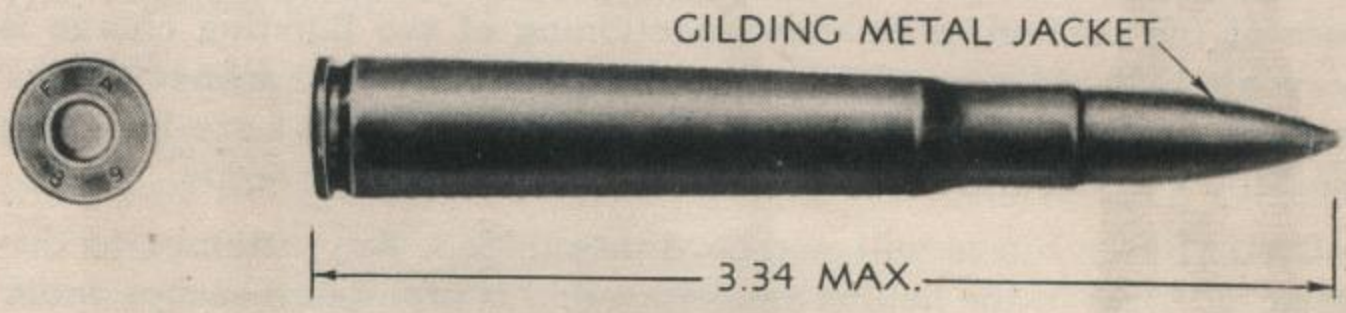
C—CARTRIDGE, TRACER, CAL. .50, M1

RA PD 2117

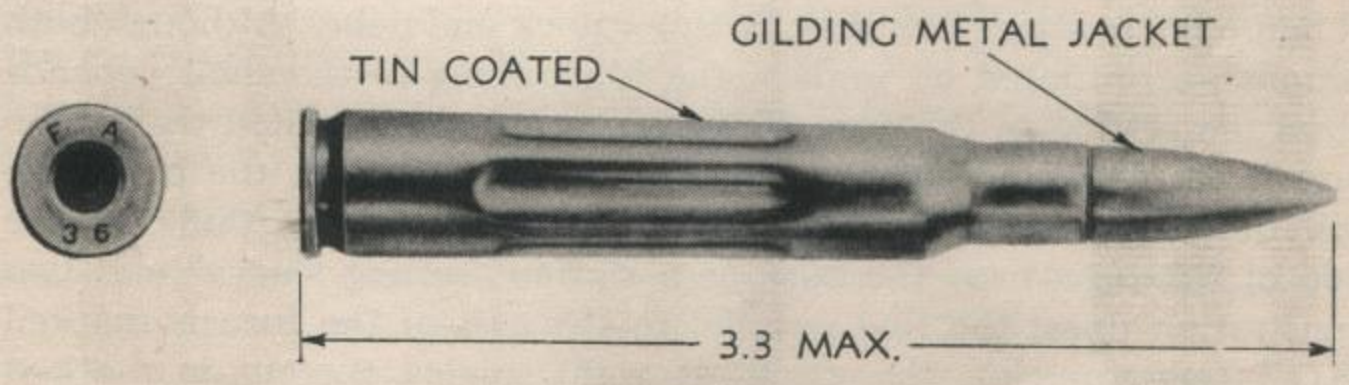
Figure 96 — Cartridges, Cal. .50



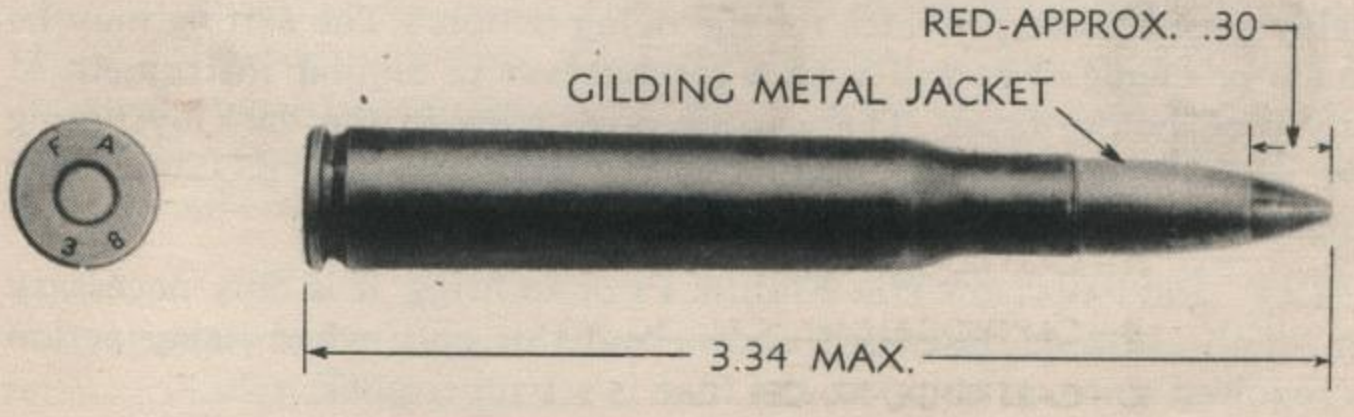
CARTRIDGE, ARMOR-PIERCING, CAL. .30, M2



CARTRIDGE, BALL, CAL. .30, M2



CARTRIDGE, DUMMY, CAL. .30, M1906 (CORRUGATED)



CARTRIDGE, TRACER, CAL. .30, M1

RA PD 5298

Figure 97 — Cartridges, Cal. .30

b. Classification. Fuzes may be classified according to the manner of functioning as "time" or "impact." Time fuzes contain a timing element in the form of a compressed black powder train or a mechanism similar to clockwork which is set, by means of a graduated time ring, to explode the shell a certain number of seconds after firing. Impact fuzes function upon striking a resistant object. Impact fuzes may be classified, according to their time of functioning after impact, as superquick or delay. According to their location, fuzes are known as point-detonating (P. D.) or base-detonating (B. D.).

c. Boresafe Fuzes. Certain fuzes are considered "boresafe." A boresafe (detonator-safe) fuze is one in which the explosive train is so interrupted that, prior to firing and while the projectile is still in the bore of the cannon, premature functioning of the bursting charge is prevented should any of the more sensitive elements, primer and/or detonator, malfunction. FUZE, P. D., M48 and M48A1 are boresafe; the M66 and M66A1 fuzes are not considered to be boresafe.

CAUTION: Fuzes will not be disassembled. Any attempt to disassemble fuzes in the field is dangerous and is prohibited except under specific directions from the Chief of Ordnance.

d. FUZE, P. D., M48A1.

(1) DESCRIPTION. This fuze, shown assembled to the projectile in figure 95, contains two actions, superquick and delay. Although both actions are initiated on impact, the functioning of the shell depends upon the setting of the fuze. However, it should be noted that if the fuze is set for superquick action, and this action fails, the projectile will function with delay action rather than become a dud On the side of the fuze, near the base, is a slotted "setting sleeve" and two registration lines; the line parallel to the axis of the fuze is marked "S.Q." (superquick), the other at right angles thereto is marked "DELAY." As shipped, the fuze is set "S.Q." To set the fuze for delay action it is necessary to turn the setting sleeve so that the slot is alined with "DELAY." (A delay pellet, 0.15 second, incorporated in the delay action train, provides for the delay action.) The setting may be made or changed at will with a screwdriver or similar instrument at any time before firing. This can be done even in the dark by noting the position of the slot, parallel to the fuze axis for "S.Q.," at right angles thereto for "DELAY."

(2) PREPARATION FOR FIRING. Prior to firing, it is only necessary to set the fuze as described above, and this only when delay action is required since, as shipped, the fuze is set superquick.

e. FUZE, P. D., M48. This fuze differs from FUZE, P. D., M48A1 primarily in that a delay pellet giving 0.05-second delay is incorporated

in the delay action train. Otherwise, the description given above applies equally to this fuze.

f. FUZE, B. D., M66 and M66A1. These fuzes are alike in manner of functioning. They are inertia-type, base-detonating fuzes which cause the projectile to burst with delay action. Incorporated in the base of the fuze body, and acting independently of the fuze mechanism, is a red tracer composition which burns for approximately eight seconds. The fuze is assembled in the base of the projectile, in which position it is covered by the cartridge case, and is not visible, therefore, in the assembled round. No preparation for firing is required.

101. GRENADES.

a. Hand Grenades.

(1) GENERAL. Hand grenades are fitted with a delay action fuze, the delay for explosive or bursting-type grenades being 5 seconds, slightly more than the average time of flight; for chemical grenades, 2 seconds, slightly less than the average time of flight. Grenade fuzes are of two types, igniting and detonating. Igniting fuzes contain a small quantity of black powder or a powder pellet which ignites the filler by its flame. Detonating fuzes contain a detonating explosive such as mercury fulminate. All hand grenade fuzes are "time" and "automatic." "Time" signifies that the fuze initiates the functioning of the grenade after a definite interval of time, and "automatic" that the fuze begins to function automatically as it leaves the hand, provided that the safety (cotter) pin is removed.

CAUTION: The detonator of the M6A2 and M6A3 fuzes is very sensitive to heat, shock, and friction. The fuze must be handled, therefore, with extreme care at all times.

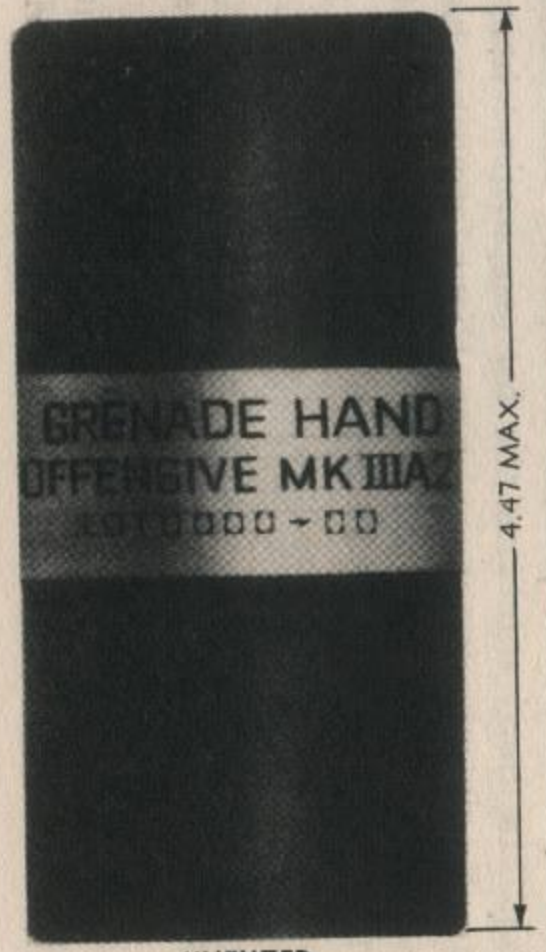
(2) GRENADE, HAND, OFFENSIVE, MK. IIIA2, UNFUZED (ADAPTED FOR HAND GRENADE DETONATING FUZE, M6A3).

(a) Description. This grenade (fig. 98) consists of a flat fiber top which is threaded to receive the FUZE, detonating, hand grenade, M6A3. The body contains the high-explosive charge of TNT. It is designed primarly for demolition, there being no marked fragmentation. The detonating fuze is designed to function after 4.5 seconds delay. The grenade body and fuze are shipped separately.

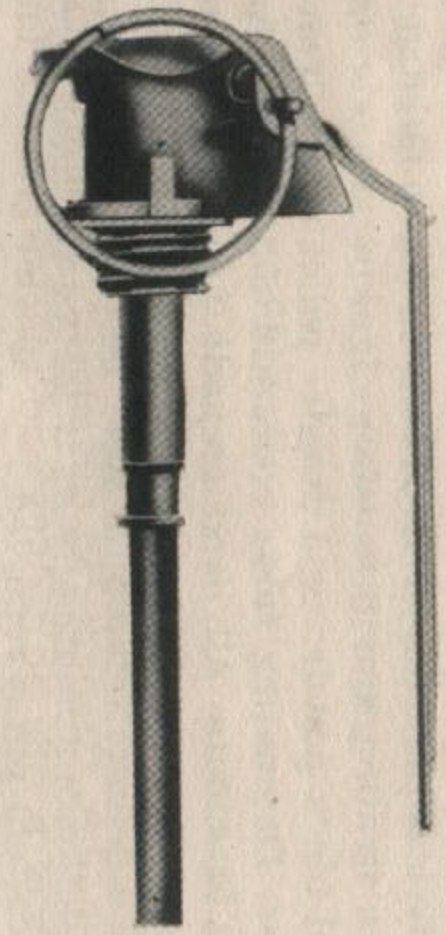
(b) Preparation for firing (fuzing). The grenade is fuzed as follows:

1. Examine the fuze cavity. If not clear, use a wooden stick to remove foreign matter.

2. Remove the fiber washer from fuze and insert the fuze into the grenade body.



UNFUZED



FUZE, DETONATING, HAND GRENADE, M6A2

FUZED

RA PD 68353

Figure 98 — Grenade, Hand, Offensive, MK. IIIA2

3. Hold the fuze in one hand and screw the grenade body on to the fuze with the other hand.

4. Seat the fuze firmly into the grenade by means of the fuze wrench.

(3) GRENADE, HAND, OFFENSIVE, MK. IIIA1, UNFUZED (ADAPTED FOR HAND GRENADE DETONATING FUZE, M6A2.) This grenade is similar to GRENADE, hand, offensive, Mk. IIIA2, unfuzed, except that it has a die-cast metal top.

(4) GRENADE, HAND, SMOKE, PHOSPHORUS, WP, M15, W/FUZE, DETONATING, HAND GRENADE, M6A2. This grenade is similar in size and shape to the GRENADE, hand, offensive, Mk. IIIA2 and uses the same type fuze. However, the body contains a phosphorus filler. Upon functioning, the grenade bursts, scattering the burning phosphorus for approximately 25 feet in all directions.

(5) GRENADE, HAND, TRAINING, MK. IA1. This grenade is of the same size, shape, and weight as the fuzed fragmentation grenade (serrated, cast-iron, lemon-shaped body) which it simulates, but is inert. It is provided for training in throwing. The grenade formerly used for this purpose was known as GRENADE, hand, dummy, Mk. I. This dummy grenade was modified by the addition of a pull ring and safety (cotter) pin, and thereby became GRENADE, hand, training, Mk. IA1.

b. Rifle Grenades. Grenades in this classification are those projected by means of a rifle or carbine and special grenade launcher attached thereto. They can be fired from all cal. .30 rifles as well as the carbine, provided the appropriate launcher is used. The proper special blank cartridges, as listed in Table I, paragraph 96, must be used for projecting the grenades. Rifle grenades detonate upon impact with the target. A safety pin located on the body of the grenade must be removed to arm the fuze. The velocity of the antitank grenade is approximately 25 yards in ½ second or 50 yards in 1¼ seconds.

(1) GRENADE, RIFLE, H. E., M9. This antitank grenade is a limited standard rifle grenade for use against armored targets. The fuze will normally detonate only on impact with a hard resistant body. This grenade weighs approximately 1.5 pounds. It is distinguished from GRENADE, A.T., M9A1, by the marking and its conical-shaped body which has a projection on its nose.

(2) GRENADE, A. T., M9A1. This antitank grenade is the standard grenade for use against armored targets. It consists of a steel body containing the high explosive, a fuze assembly, and a tail assembly which consists of a hollow tube and a wheel-shaped fin. Its fuze is more sensitive than the fuze in GRENADE, rifle, H. E., M9, and may func-

tion upon impact with soft earth. This grenade weighs approximately 1.31 pounds. It is distinguished from GRENADE, rifle, H. E., M9, by the marking and its round-nosed cylindrical body.

(3) GRENADE, A. T., PRACTICE, M11. This grenade is an inert (dummy) grenade, similar in shape and weight to GRENADE, rifle, H. E., M9, provided for training and practice in aiming and firing. It consists of two parts, a head and a fin assembly. The fin assembly is replaceable when damaged by repeated use. Fin assemblies and extra rifle grenade cartridges are provided separately.

(4) GRENADE, A. T., PRACTICE, M11A1. This grenade is an inert (dummy) grenade, similar in shape and weight to GRENADE, A. T., M9A1, provided for training and practice in aiming and firing. It consists of two parts, a head and a fin assembly. The fin assembly is replaceable when damaged by repeated use. Fin assemblies and extra rifle grenade cartridges are provided separately.

(5) GRENADE, A. T., PRACTICE, M11A2. This grenade is a redesign of the M11A1 practice grenade, consisting of a castiron body with a stabilizer tube which screws into it. The ogive is similar to that of the GRENADE, A. T., M9A1, and is fastened to the body by a modified bayonet mount. The fin slides over the stabilizer tube when the tube is unscrewed from the body, and is prevented from sliding off the end of the tube by a rolled lip. The ogive and fin are replaceable when damaged in use, provision being made for issuance of extra ogives and fins. Grenade cartridges are provided separately.

(6) GRENADE, RIFLE, FRAGMENTATION, IMPACT, T2. This is an antipersonnel grenade for use with standard grenade launchers and grenade cartridges. An impact type of fuze explodes the grenade on impact. The grenade body is a serrated castiron body similar to the standard hand fragmentation grenade, but the grenade is otherwise similar to the antitank types described above. When firing these grenades, best results will be obtained by placing the butt of the rifle on the ground.

(7) PREPARATION FOR FIRING. Just prior to firing:

(a) Insert the appropriate grenade cartridge in the weapon, leaving the bolt open.

(b) Place the antitank or fragmentation grenade firmly on the launcher.

(c) Remove the safety pin.

(d) Close the bolt of the weapon.

(8) RIFLE AND CARBINE GRENADE CARTRIDGES. The CARTRIDGE, rifle grenade, cal. .30, M3 is a special blank cartridge for use

in projecting antitank grenades, or fragmentation grenades assembled with adapters, from rifles. No other blank cartridge will be used for this purpose. Only the CARTRIDGE, grenade, carbine, cal. .30, M6, will be used for the same purpose when firing the carbine. These grenade cartridges are distinguished from other cal. .30 cartridges by having no bullet and having a five-petal-rose crimp in the mouth of the cartridge case. The rifle grenade cartridge is about 2.5 inches in length and weighs about 250 grains, whereas the carbine grenade cartridge is about 1.7 inches in length and weighs about 103 grains. The average velocity of the grenade, at 5½ feet, projected from the launcher using the rifle grenade cartridge in a rifle is 165 feet per second, whereas it is 145 feet per second when using the carbine grenade cartridge in the carbine.

102. SMOKE POTS.

a. General. A smoke pot consists essentially of an igniter element, a starter mixture, and a smoke filler capable of producing comparatively large quantities of smoke for relatively long periods of time. These are held in a container of a construction adapted for easy transportation or carrying by hand.

b. Smoke Pot, HC, M1.

(1) DESCRIPTION. The container consists of a cylindrical tin can, 7¾ inches in height by 5 5/16 inches in diameter, holding a matchhead, a starter mixture and a nontoxic, HC filler. The total weight of the assembly is about 13¼ pounds. The top of the container has a circular hole in which is seated the cup holding the starter mixture. This cup is covered by a circular piece of cardboard which is pierced by a small hole in which is fitted the matchhead. Above the paper disk protecting the matchhead is a scratcher block consisting of a strip of wood coated on one side with a red phosphorus mixture. A cover with carrying handle is held to the top of the container by a strip of adhesive tape around the rim. A metal band encircling the body and a transverse metal strap hold the handle in place. The smoke pot may be ignited by use of the scratcher or by means of an electric squib. The smoke pot should come up to full production in 10 to 20 seconds. Full-volume burning time averages about 6¼ minutes but may vary from 5 to 8 minutes. Two or more pots may be stacked or laid end to end to obtain a longer time of burning and screening; the first or top pot ignites the one behind it by its heat when it is almost burned out.

(2) PREPARATION FOR FIRING. For manual firing, remove the metal clamp and strap which hold the cover in place. Then remove the adhesive strip around the cover and take off the cover. Remove the scratcher from its envelope and the protective disk from the match-

Figure 99 — Smoke Pot, HC, M1

head. Draw the scratcher quickly across the matchhead until it ignites the matchhead. NOTE: The matchhead must be protected from moisture when the cover is removed, until the pot is ignited. To prepare for firing by means of an electric squib, remove the cover and take out the matchhead. Insert the squib so that the flash holes will point toward and be in contact with the starter mixture. The squib should be securely taped in place and the connector wires looped around the smoke pot so that the squib cannot be pulled loose.

103. PACKING.

a. Data. While weights of individual ammunition items vary somewhat, depending upon the type and model, the data in Table V are considered representative for estimating weight and volume requirements. Complete packing data is published in SNL R-1, SNL S-4, and SNL T-1.

b. Marking for Shipment.

(1) Packings for shipment, and identification and shipping plates, are marked as follows:

(a) Name and address of consignee (or code marking).

(b) List and description of contents.

RA PD 6

Figure 99 — Smoke Pot, HC, M1

AMMUNITION

TABLE V — PACKING DATA

Ammunition	Packed	Dimensions of Box (Inches)	Volume (Cubic feet)	Weight (Pounds)
76-mm, H. E. and A.P.C.	Individual fiber containers, 3 containers per bundle. 3-round bundle, crated†	$39\frac{9}{16}$ x $10\frac{5}{8}$ x $9\frac{7}{32}$	2.24	106.0
Cal. .50	One 110-rd. belt per expendable steel box, 2 boxes per wire-bound crate...	$14\frac{5}{8}$ x $13\frac{1}{8}$ x $8\frac{3}{8}$	0.93	71.0
Cal. .30 rifle	12 5-rd. clips per bandoleer, 8 bandoleers per container, 2 containers (960-rds.) per wooden box....	$15\frac{17}{32}$ x $12\frac{13}{16}$ x $9\frac{17}{32}$	0.57	79.0
Cal. .30 carbine	50 per carton, 30 cartons per outer waxed container, 2 containers (3000 rds.) per wooden box	$14\frac{1}{4}$ x $10\frac{3}{4}$ x $9\frac{5}{8}$	0.86	....
Hand grenades, chemical	Individual fiber containers, 25 containers per box....	$18\frac{1}{2}$ x $16\frac{15}{16}$ x $8\frac{25}{32}$	1.60	70.0
Rifle grenades	Individual fiber containers, 10 containers and 11 cartridges per box	$17\frac{27}{32}$ x $7\frac{1}{16}$ x $15\frac{1}{2}$	1.13	31.0
Smoke pots	Six per wooden box	$21\frac{1}{8}$ x 13 x $11\frac{9}{16}$	1.90	100.0

†—For oversea shipments.

(c) Ammunition Identification Code (A.I.C.), as published in SNL's and OFSB 3-14.

(d) Gross weight in pounds, displacement in cubic feet.

(e) The number of the package.

(f) The letter "U.S." in several conspicuous places.

(g) Order number, contract number, or shipping number.

(h) Ordnance Insignium and Escutcheon.

(i) Name or designation of consignor preceded by the word "From."

(j) Lot number.

(k) Month and year packed.

(l) Inspector's stamp.

(2) For ammunition other than small-arms ammunition, the adhesive strips on fiber containers are in the same color as the projectile, in accordance with the color scheme in paragraph 93. It will be noted that a yellow strip indicates a high explosive item.

(3) For small-arms ammunition, the use of color bands to indicate the type of cartridge has been discontinued. For repacked lots a stenciled figure symbol on the box clearly indicates the type of inner packing. The stenciled symbols are vertical for cal. .30 cartridges and diagonal for cal. .50 cartridges. Markings are also stenciled on the box to indicate the type, or types, and the ratio of the cartridges within the box, for example, "4 BALL M2, 1 TR M1."

104. DEFECTS FOUND AFTER FIRING SMALL-ARMS AMMUNITION.

TABLE VI

Name of Defect	How to Recognize	Common Causes, Precautions
Misfire.	No action on firing. Primer shows normal impression of firing pin.	Primer is defective.
	No action on firing. Primer shows light impression of firing pin.	Indicates mechanical defect in weapon as short or broken firing pin, weak firing pin bolt of weapon not being completely locked, or grease in firing pin hole which cushions blow of firing pin; or caused by defective cartridge or primer.
	No action on firing. Primer shows normal impression of firing pin, but off center.	Defect in weapon.
Hangfire.	Delayed ignition of powder in the cartridge.	Small or decomposed primer pellet, damp powder or light blow of firing pin caused by dirt or defect in weapon. This is a serious defect if delay is long enough to permit the bolt to be opened before the powder burns completely, in which case injury to firer or damage to weapon, or both, may result.

AMMUNITION

Name of Defect	How to Recognize	Common Causes, Precautions
Pierced primer.	Perforation of primer cup by the firing pin. Discoloration around indent of very small perforation. Disk from large perforation blown into action of gun, with such an escape of gas as to lower velocity of the shot.	Imperfect firing pin or very thin metal in base of primer cup.
Primer leak.	Discoloration around the primer and the head. Slight discoloration when primer leak is small, or heavy for a large primer leak.	Too small a primer, too large a primer hole, or excessive pressure generated by propelling charge.
Blown primer.	Primer is blown completely from pocket of cartridge case.	Serious defect but seldom encountered.
Primer setback.	Primer protrudes above the metal head.	Defective bolt or cartridge, or excessive pressure.
Leak back of case.	Discoloration along body of cartridge case.	Escape of gas into the action of weapon.
Failure of case to extract.	Failure of case to extract.	Defective extractor or cartridge.
Blowback.	Escape of gas to the rear.	Pierced primer, primer leak, blown primer, and ruptured cartridge case.
Split neck.	Neck of case splits and is accompanied by escape of gas to the rear, upon firing.	Not to be confused with a split neck due to season cracking which can be observed before firing.
Split body.	Longitudinal split in body of case, thereby reducing velocity of the shot.	Case of body made of defective material or has a deep draw scratch.
Stretch.	Continuous ring around the body of a fired cartridge case.	Generally due to improper head space.
Complete rupture.	Circumferential separation completely around body of cartridge case, causing it to separate into two parts.	Bad bolt locking, excessive head space, or defective cartridge case. This is a serious defect, because if the forward portion of case remains in the chamber after extraction, it will cause the next round to jam.
Partial rupture.	Partial circumferential sepration completely around body of cartridge case.	See **Complete rupture.**

105. FIELD REPORT OF ACCIDENTS.

When an accident involving the use of ammunition occurs during training practice, the procedure prescribed in Section VII, AR 750-10 will be observed by the ordnance officer under whose supervision the ammunition is maintained or issued. Where practicable, reports covering malfunctions of ammunition in combat will be made to the Chief of Ordnance, giving the type of malfunction, type cf ammunition, the lot number of the complete rounds or separate loading components, and condition under which fired.

Section XIV

REFERENCES

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106. STANDARD NOMENCLATURE LISTS.

a. Ammunition.

Ammunition, fixed and semifixed, all types, for pack, light, and medium field artillery, including complete round data ..... SNL R-1

Ammunition, rifle, carbine and automatic gun..... SNL T-1

Firing tables and trajectory charts ..... SNL F-69

Grenades, hand and rifle, and fusing components.... SNL S-4

Packing materials used by field service for small arms service ammunition ..... SNL T-5

Rockets, all types, and components ..... SNL S-9

Service fuzes and primers, for pack, light and medium field artillery ..... SNL R-3

b. Cleaning, preserving and lubricating materials; recoil fluids, special oils, and miscellaneous related items ..... SNL K-1

c. Gun Materiel.

Carbine, cal. .30, M1 ..... SNL B-28

Gun, 76-mm, M1; Mount, gun, 76-mm, T1 ..... SNL C-58

Gun, machine, cal. .50, Browning, M2, heavy barrel, fixed and flexible and ground mounts ..... SNL A-39

d. Sighting Equipment.

Periscopes, telescopes for periscopes ..... SNL F-235

Quadrant, gunner's, M1 ..... SNL F-140

Sights, bore ..... SNL F-10

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Current Standard Nomenclature lists are as tabulated here. An up-to-date list of SNL's is maintained as the "Ordnance Publications for Supply Index" ..... OPSI

107. EXPLANATORY PUBLICATIONS.

a. Ammunition.

Ammunition, general ..... TM 9-1900

Ammunition identification code (A.I.C.) ..... OFSB 3-14

Grenades ..... FM 23-30

Qualifications in arms and ammunition training allowances ..... AR 775-10

Range regulations for firing ammunition for training and target practice ..... AR 750-10

Small-arms ammunition ..... OFSB 3-5

Small-arms ammunition ..... TM 9-1990

Targets, target materials and rifle range construction ..... TM 9-855

b. Chemicals.

Chemical decontamination materials and equipment ..... TM 3-220

Defense against chemical attack ..... FM 21-40

Protective measures, individuals and small units FM 21-45

c. Miscellaneous.

76-mm Gun motor carriage T70 ..... TM 9-755

Cleaning, preserving, lubricating and welding materials and similar items issued by the Ordnance Department ..... TM 9-850

Echelon system of maintenance ..... TM 10-525

d. Small-arms.

Browning machine gun, cal. .50, HB, M2 (mounted in combat vehicles) ..... FM 23-65

Browning machine gun, cal. .50, HB, M2, ground FM 23-60

Ordnance maintenance—Browning machine gun, cal. .50—all types ..... TM 9-1225

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76-MM GUN MATERIEL M1 (COMBAT VEHICLES)

[A.G. 300.7 (9 June 1943)
O.O. 461/43321 O.O. (23 June 1943)]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
Major General,
The Adjutant General.

Distribution: R 9(4); Bn 9 and 18(2); C 9(8); IC 18(10)

(For explanation of symbols, see FM 21-6)

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